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Soviet Tank Programs

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SOVIET TANK PROGRAMS

Information available as of 1 December 1984 was used in the preparation of this Memorandum.

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SUMMARY AND KEY JUDGMENTS

The Soviets continue to regard the tank as the most important element of their army's conventional combined-arms team. They rely on the tank to provide mobile, protected firepower for decisive, high-speed, offensive operations in a way that no other currently available weapon system can. The tank will almost certainly continue to be the primary weapon in the Soviet combined-arms inventory for the rest of this century, although we expect that the Soviets will have to make continuous technical, tactical, and organizational adjustments to make it possible for the tank to remain a viable weapon on both the nuclear and the conventional battlefields. These adjustments appear to be already in progress.

Current Programs

In an effort to ensure that their army will always be equipped with sufficient numbers of tanks capable of participating effectively in rapid-paced offensive operations, especially against NATO forces, the Soviets have created a costly armored vehicle research, development, testing, and evaluation (RDT&E) establishment that includes thousands of scientists, engineers, technicians, and managers and involves the employees of numerous defense-industrial ministries and even many civilian ministries. Most recently, this establishment has developed three major new tank models that are currently being fielded with tank troops: product-improved versions of the T-64 and T-72, and the T-80. The latest T-64 version—the T-64B—is the first Soviet tank capable of firing tank gun ammunition and antitank guided missiles (ATGMs) through its main gun tube. The T-80, which appears to incorporate features of both the T-64 and T-72 series, also can fire ATGMs through its main gun tube in addition to conventional ammunition. Moreover, the T-80 is the first Soviet tank to be propelled by a gas turbine engine.

All three of these tanks are formidable fighting vehicles that are capable of defeating any currently fielded NATO tank at normal battle ranges. They are not invulnerable to US antitank weapons, however,

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and probably could be defeated by selected US antitank weapons, if these weapons were properly employed and available in adequate numbers.

Future Programs

We judge that the Soviets almost certainly will field a completely new tank design or designs by the early 1990s to meet the threat posed by NATO's formidable future antitank forces. We expect the Soviets to continue to develop main battle tanks in the foreseeable future instead of returning to the development of light, medium, and heavy tanks, as they did during the 1940s and early 1950s. Because of the recent Western advances in armor-piercing ammunition and shaped-charge warheads for ATGMs, the major challenge to Soviet tank designers will be to increase armor protection while maintaining mobility. The Soviets probably will arm their tanks with improved versions of the 125-mm smoothbore tank gun in the future because this gun design still has significant potential for performance growth. Soviet designers may be able to create an acceptable vehicle using the traditional turreted tank design that has dominated the battlefield for the last 50 years. If so, the design will require technically advanced armors to provide the required protection with a 45- to 50-metric-ton weight limit. On the other hand, they may field a tank with a reduced-volume turret or no turret at all—an option that would not require the development of technically advanced armors. Any of these options could result in a tank weighing less than 50 metric tons with a significantly greater level of armor protection than currently available designs can provide.

Whichever option or options the Soviets choose, they almost certainly will strive to overcome other, less critical weaknesses that are apparent in their current generation of tanks. Specifically, they probably will:

— Continue to improve fire-control systems to increase their ability to acquire a target and reduce the time needed to find the target's range and hit it.

— Fit their tanks with improved night vision equipment, either active or passive or a combination of the two.

— Strive to develop a thermal imaging system similar in capabilities to the ones used in the M-1 and M-60A3 tanks.

— Continue to develop and improve their antitank weapon countermeasures and supplemental armors.

Future Tank Development and Technology Transfer

We believe that the Soviets can develop and produce tanks to suit their future operational requirements, the embargo on the transfer of Western technology to the USSR notwithstanding. The embargo may, however, cause the period necessary for development to lengthen and developmental costs to rise. Stemming the flow of manufacturing technology to the Soviet tank production establishment, moreover, may make it more difficult for the Soviets to fabricate complex new tank designs efficiently.

Tank Production

The Soviets appear to have been expanding the tank production area of their three major tank assembly plants at Khar'kov, Nizhniy Tagil, and Omsk and have recently begun assembling T-72–series tanks at the tractor plant in Chelyabinsk, which previously had been a producer of major tank components. The expansion at the three major plants may have been undertaken in part to accommodate a new generation of sophisticated machine tools, many of which were purchased in the West, and new fabrication techniques. These improvements probably do not presage an increase in annual output. Instead, the Soviets probably have undertaken them in an attempt to maintain previous production levels in spite of the substantially greater sophistication of the latest tank models and the strain that this sophistication places on production resources, both human and material. We expect that Soviet tank production will continue to average about 3,000 vehicles a year, which was the estimated average annual tank production level in the 1973-83 period.

The Soviets continue to possess an impressive excess of production capacity at their main plants. If they were to mobilize their industrial base and place it on a wartime footing, they could increase their tank production level substantially if they were able to maintain an adequate flow of key subcomponents to the main tank assembly plants.

Tank Deployment

We expect the Soviets to continue to adhere to their deployment strategy of the past 35 years: they will equip tank units opposite NATO forces in Central Europe with the latest, most capable tanks before they begin to send large numbers to units in other theaters of military operations. The tank inventories of units opposite NATO's central and southern European forces and of units belonging to the Soviet army's strategic reserve are substantially more modern than those of units in other Soviet theaters. The bulk of the modern tanks in the strategic

reserve probably would be used to support the forces operating against NATO. The tank inventories of other theaters probably will continue to be significantly less capable than those of units earmarked for commitment against NATO's forces in central and southern Europe.

Implications for NATO

In a war in Central Europe between NATO and the Warsaw Pact, the Pact's objective would be to mount an irresistible, rapid-paced ground offensive. Supported by theater air forces, Pact forces would seek to quickly cross the Rhine River and overrun France and the Low Countries. They would hope to force NATO to capitulate, ideally before any strategic nuclear exchange occurred. NATO defenders would use air, ground, and, in selected circumstances, naval forces in an effort to prevent the Pact from achieving this goal. NATO defenders' chief task would be to slow or defeat Soviet armored formations. NATO air forces would certainly engage these formations, but the burden of defense would fall most heavily on ground units tasked with destroying Pact, especially Soviet, tanks.

Currently, Pact tank forces outnumber NATO's about 3 to 1 in central Europe. The majority of the Soviet force is made up of tanks of the T-64 and T-72 series, although a substantial number of older tanks—T-62s and T-55s—remain in many units. The latest tank, the T-80, is in the early stages of replacing T-62s in Soviet units in East Germany. The newest version of the T-72 is replacing T-62s and T-55s in Soviet units in Czechoslovakia. The latest version of the T-64 is supplementing older T-64 models in East Germany. The replacement process will not be completed until 1986 at the earliest and may take even longer.

If a Soviet conventional ground attack were to occur in the near future, US Army units would be armed with only limited quantities of ATGMs and armor-piercing ammunition with the technical capability to defeat these tanks at normal battle ranges. [

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To counter the Soviets' weight of numbers and the lethality of their weapons, US commanders would have to implement their tactical doctrine optimally and strive whenever possible to slow the enemy's advance and to engage the enemy from above or from the side in order to maximize the number of tank kills. At the same time, US commanders would have to try to preserve their own forces by minimizing their exposure to Soviet fire. Adequate levels of well-coordinated air support might prove to be critical to a successful defense.

Large numbers of tank and motorized rifle divisions from the western military districts of the USSR, which make up the forces of the second strategic echelon, would be even more difficult for US antitank forces to defeat than the forward-area Soviet tank force because the second echelon has a greater number of T-72s, T-64s, and T-80s.

This situation probably will not change significantly for several years because programed improvements to US antitank forces in West Germany will be offset by the continuing improvement of the Soviet forward-area tank force. The Soviets' chief advantage will continue to be their superior numbers.

DISCUSSION

A. ROLE OF TANK IN SOVIET CONCEPT OF LAND WARFARE

1. The Soviets continue to regard the tank as the most important element of their ground forces' combined-arms team: it forms the backbone of their tank and motorized rifle units (see figure 1). They rely on the tank to provide mobile, protected firepower for decisive, high-speed offensive operations in a way that no other currently available weapon system can.

2. In a conventional offensive, Soviet reconnaissance elements, including tanks responsible for performing reconnaissance by fire, would attempt to ascertain the disposition of the enemy's forces. After assessing the enemy's deployment of forces, motorized rifle troops would concentrate for an attack on apparent weak points in an effort to achieve a breakthrough. Tanks usually would accompany these troops to provide direct fire support. Their targets probably would include personnel, armored vehicles, and fortified positions. Their fire probably would be supplemented by that of attack helicopters and close-air-support (CAS) aircraft. Indirect fire support would be provided by rocket and tube artillery units. After a breakthrough had been achieved, tank units accompanied by motorized rifle troops would lead an exploitation force through the newly created gap to pursue fleeing defenders or encircle and destroy outflanked defenders that chose to stand and fight.

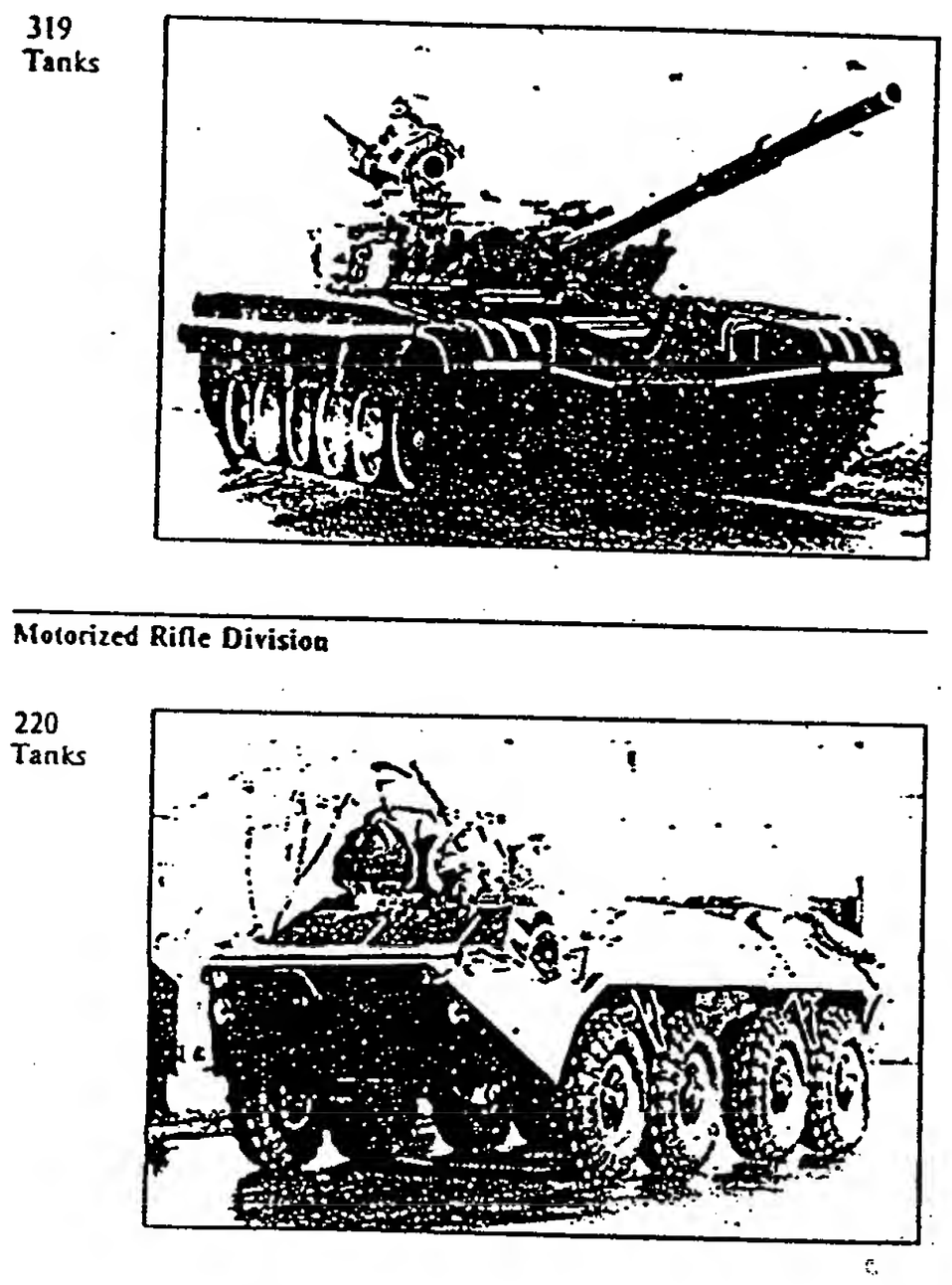
3. Even nuclear, biological, and chemical (NBC) weapons have not diminished the importance of the tank. If anything, that importance has been heightened because the tank appears to be more readily adaptable than most other weapons to operations under NBC conditions.

Historical Overview

4. Soon after the formation of the Red Army, its leaders recognized the potential combat value of the tank. By 1931, they had developed a fundamentally new doctrine stressing attacks into the enemy's rear areas by combined-arms forces that depended heavily on tanks for their striking power. In support of this new doctrine, the Soviets embarked on a major tank development program.

5. Despite initial setbacks during World War II, which were in large part due to the chaos created within the army by the purges of the late 1930s, the

Figure 1
Tank Holdings of a Soviet Tank or Motorized Rifle Division



Soviets took the offensive and eventually inflicted a series of decisive defeats on the German Army. These successes resulted from both joint and combined-arms operations, but the Soviets concluded that the tank, operating with adequate fire support, had contributed more to these successes than any other ground force weapon. Moreover, they learned that, to ensure operational success, their army had to have far greater numbers of armored vehicles, especially tanks, than their opponents.

Tanks and Nuclear War

6. The development of nuclear weapons did not cause the Soviets to stop the development and procurement of tanks. After extensive study and debate, they concluded that, although nuclear weapons would be decisive in any future general war, they had not rendered the tank obsolete. Indeed, the Soviets identified the tank as the weapon system most likely to survive on the nuclear battlefield and as the best system for rapidly exploiting nuclear strikes on the opposing forces. Soviet war plans, therefore, envisioned that tactical nuclear weapons would open gaps in enemy defenses through which tank troops could quickly pour to pursue surviving defenders, destroy reserves, and capture key installations in the rear area.

7. The continuing utility of tanks on the modern battlefield was reemphasized in 1967 when NATO formally discarded the doctrine of massive retaliation in favor of the doctrine of flexible response. This gave official NATO recognition to the concept that a general war in central Europe would probably begin with a conventional phase, possibly prolonged—a concept shared by the Soviets.

Technical, Tactical, Organizational, and Operational Adjustments

8. In the Soviet view, continuous technical, tactical, and organizational adjustments have made it possible for the tank to remain a viable weapon on both the nuclear and the conventional battlefields. The Soviets recognized at an early date that the tank's relatively heavy armor protected its crew against the blast of a nuclear detonation as well as against selected forms of initial and residual radiation. By providing their tanks with radiation-absorbing liners, they have been able to increase the protection level further. This means that tank troops can operate close to areas contaminated by nuclear detonations and survive, while troops riding in vehicles with thinner skins cannot in many cases. Moreover, the tank's mobility means that tank troops can be dispersed until just before an attack, making them relatively elusive targets for enemy nuclear weapons.

9. On the nonnuclear battlefield, the principal challenge has been to adjust to the threat posed by the Western development of antitank guided missiles (ATGMs), highly lethal kinetic-energy (KE) rounds, sophisticated target acquisition systems, and precision-guided munitions. The Soviets have responded to this threat in a variety of ways:

- Reorganization of many of their ground combat formations to include greater numbers of more capable fire-support weapons to suppress enemy antitank forces.
- Experimentation with new fire-support formations designed to engage powerful, mobile enemy fire-support systems operating deep in the enemy's rear.
- Alteration of operational plans to provide additional fire-support for combat formations as they move forward to contact the enemy.
- Rapid expansion of the Soviet CAS helicopter force.
- Reorganization of the CAS helicopter force to make it more responsive to lower-level combat unit commanders.
- Increase in the number and quality of Soviet combat engineering forces to help ensure the rapid passage of tank forces across the battlefield.
- Development of tactics to maximize the survivability of tanks and their crews.
- Development of laminate armor more resistant to both shaped-charge and KE rounds than traditional steel armor.
- Provision of additional armor in many newer Soviet tanks as well as systems to reduce the likelihood of enemy detection.
- Development and deployment of system-specific countermeasures against guided munitions.

10. In addition, the Soviets have created an extensive logistic support system to ensure that they can sustain a rapid, continuous offensive in central Europe. This system includes forward-area depots of critical supplies, such as POL (petroleum, oil, and lubricants), ammunition, and rations, and a transportation network capable of moving these supplies to units on the march. The transportation network includes

materiel support units subordinate to fronts, armies, and divisions. As a front's combat units moved forward in wartime, depots of critical supplies would be moved forward too, but these depots would always remain outside the range of conventional field artillery. In the case of POL, tactical pipelines would be laid as the front advanced, connecting the mobile supply depots of the front with major commercial pipelines.

The Future Role of Tank Forces

11. The tank almost certainly will continue to be the primary weapon in the Soviet combined-arms inventory for the remainder of this century. Although the Soviets appear to be alert to the tank's vulnerabilities, we see no evidence that they are planning fundamental changes in their doctrine or tactics that would diminish the importance of the tank, nor have they discussed a replacement. Further, they are expanding the research, development, and production facilities that have been associated with tank programs. In addition to this, they are also substantially modernizing older tank models. Apparently, they continue to believe that no other weapon combines firepower, protection, and mobility more effectively than the tank in the shock force role. Moreover, they have made such a heavy investment in tank forces that replacement would require an enormous expenditure.

12. However, to ensure that the tank continues to be an effective weapon, the Soviets must continue to make organizational and tactical adjustments, as well as technical improvements, to compensate for the growing lethality of Western antitank weapons and forces.

Tactical Improvements

13. Substantial change is already under way in the Soviet army. The Soviets have continued to refine their combined-arms tactics in an effort to adjust to NATO's rapidly improving antitank forces. Probably the most important current development is the operational maneuver group (OMG). It appears that the front OMG is an elaboration of the tank army concept. The tank army was developed during World War II as a second-echelon force specifically charged with pursuit and exploitation missions. The front OMG mission will be undertaken by a tank-heavy combined-arms force of varying size and composition that can be assigned a wider range of tasks than the tank army and is also designed to operate independently farther from friendly forces—sometimes as much as 300 to 500 kilometers. According to Warsaw Pact military writings, the OMG was devised to be more effective than the tank army in ensuring high rates of advance against NATO forces, especially antitank forces. An OMG, unlike a tank army, would seek to avoid combat with an enemy main force or frontline units and march instead to capture or destroy key rear objectives such as nuclear delivery systems and depots, airfields, river-crossing sites, and command posts. It can also be used to interfere with mobilization and the movement of enemy reserves.

14. The OMG is designed as part of a larger operational scheme that relies more on maneuver than on fire to achieve victory. If this overall plan is implemented successfully, it could buy victory more cheaply in terms of casualties and destroyed equipment than previous operational plans.

Organizational Improvements

15. Although there has been relative stability during the last several years in the organization and authorized equipment of tank battalions, the number and capabilities of mechanized infantry, artillery, and helicopter fire-support weapons and combat engineering equipment in ready tank and motorized rifle divisions have been increasing significantly. Nondivisional missile and field artillery units are also being strengthened. These improvements boost the fire power of the combined-arms forces and increase their mobility and flexibility. From the army commander's perspective, these improvements translate into a greater ability to disrupt enemy defenders in general and to suppress enemy antitank forces in particular. Thus, the Soviets believe that these force improvements should enable tank units to exploit initial successes by rapidly advancing deep into enemy territory to destroy reserves and capture key installations despite improvements in enemy antitank forces.

Economic Constraints

16. These organizational and tactical adjustments and the potential technical improvements explored in section B, below, will not come cheaply, and, because the Soviet economy appears to be experiencing fundamental difficulties, we expect that the Soviet military will be obliged to be selective and circumspect in their expenditures for their tank force during the next several years. Because the tank is so important to the Soviet army, the army will continue to procure large numbers of new tanks, but the procurement rate

probably will be more modest than during the late 1960s and early 1970s, when we estimate the Soviets procured nearly 4,000 tanks a year. Moreover, the Soviets probably will modernize large numbers of older tanks to reduce the need to procure new, more expensive models.

17. We have estimated the procurement costs of various Soviet tank models in 1982 dollars and have concluded that the cost of individual tank models has risen sharply in the last 20 years. The T-55 and T-62, both of which were introduced 20 to 25 years ago, would now cost about $500,000 each to produce. The next models to be introduced, the T-64A and the initial production version of the T-72, cost $800,000 to $850,000 each. The latest, most sophisticated tanks, the T-64B and the T-80, cost $1-1.4 million each. Future models promise to be even more expensive. The costs involved in the reorganization of Soviet ground forces and the costs inherent in the development of new doctrine and tactics are also high, although they are difficult to quantify precisely.

B. SOVIET TANK PROGRAMS

18. Improvements in Western tank and antitank weapons, organization, and tactics impel the Soviet defense establishment constantly to develop new, more capable tanks. To ensure that the Soviet army's ready divisions will always be equipped with sufficient numbers of tanks capable of participating effectively in rapid-paced offensive operations, the Soviets have carefully organized their tank-related research and development efforts. Over the years they have established an extensive and expensive armored vehicle research, development, testing, and evaluation (RDT&E) establishment that includes thousands of scientists, engineers, technicians, and managers and involves the employees of numerous defense-industrial ministries and even many civilian ministries. Some of these professionals engage in basic and applied research that relates to tanks and tank components and even to fabrication technology. Others are responsible for translating the fruits of domestic and foreign research, acquired legally or illegally, into new tank designs.

Design Requirements

19. Since World War II, these RDT&E personnel have worked to develop tanks meeting a set of operational requirements that appear to have changed little over the years. The Soviet army's Main Armored Directorate of the Ministry of Defense has consistently commissioned designs that promise to result in a tank that, given available technology:

- Mounts a powerful main armament capable of defeating enemy tanks at most anticipated battle ranges.
- Is protected from most antitank weapons across the frontal 60-degree arc of the turret and the upper glacis at expected battle ranges.
- Possesses a power-to-weight ratio sufficient to assure that the vehicle can move across most types of terrain.
- Has the capability to travel at least 450 kilometers over roads without refueling.
- Can operate in the presence of NBC weapons.
- Can cross rivers less than 5 meters deep without bridging equipment.
- Is narrow enough to be transported by rail.
- Can operate reliably under day and night combat conditions and in adverse weather.
- Involves minimal production costs and complexities.

First Postwar Tank Generation: T-54, T-55, and T-62

20. In the immediate post–World War II era, the Soviets produced the T-54, a design that met most of these requirements adequately. It mounted a larger gun than Western designs, was lighter by virtue of its configuration and the concentration of most of its armor in the frontal 60-degree arc, and possessed a higher net power-to-weight ratio that ensured reasonably good mobility. Moreover, it was rugged, reliable, and relatively cheap and easy to produce.

21. The Soviets proceeded to perfect this design by making incremental improvements, using components of proven technology to minimize the risk of designing and producing a tank that would be a costly failure. This program of progressive improvements resulted in the T-55 and T-62. The T-55 followed the T-54 into the active inventory in the late 1950s, and the T-62 followed the T-55 a few years later. The T-55's better power-to-weight ratio made it more mobile than the T-62, but the T-62 mounted a main gun of larger caliber.

Second Postwar Generation: T-64, T-72, and T-80

22. In the mid-1950s the Soviets realized their tanks would soon face a variety of new threats from tactical

nuclear weapons to highly capable enemy tanks and ATGMs. If the Pact's tank forces were to remain capable of spearheading a rapid-paced offensive operation against NATO, new tank designs would be needed.

23. Soviet designers responded with the T-64 and T-72 tanks. These tanks incorporated a number of relatively complex and expensive components and design features that were not carryovers from the T-54, T-55, and T-62 line.

T-64 Series

T-64A

24. In many ways the T-64 series was a bolder departure from previous designs than the T-72. The series' first version produced in large numbers was the T-64A (see figure 2, page 12).

25. ***Protection.*** The development of ATGMs and more effective shaped-charge warheads meant that it was no longer practical to protect a tank with solid steel armor because it would have to be so thick to be effective that the tank would be virtually too heavy to move. The T-64A's designers solved this problem by incorporating nonmetallic substances into the tank's armor array. When compared with an equal weight of steel, these substances give a much higher level of protection against shaped-charge warheads. Soviet designers sandwiched a layer of nonmetallic material between two plates of rolled steel—the outer plate being thicker than the inner one—and angled them to form the front upper hull, called the glacis (see figure 3, page 13).

26. The T-64A's turret also reportedly incorporates nonmetallic material that fills cavities in the front of the turret (see figure 5, page 15). Although we lack details about the materials and precise configuration of this turret armor array, we estimate that it provides the same level of protection against KE and shaped-charge rounds as the front upper hull. Moreover, the T-64A incorporates this level of protection while weighing only 38 metric tons.

27. We assess that the armor on the top of the T-64A's turret is 50 mm thick; the armor of the hull roof, 30 mm; and the armor of the hull floor, 20 mm.

28. Some sources report that, in addition to this integral protection, the T-64A, as well as other tanks of the second postwar generation, is equipped with supplemental armor in the form of screens or shields for the turret and the hull sides.

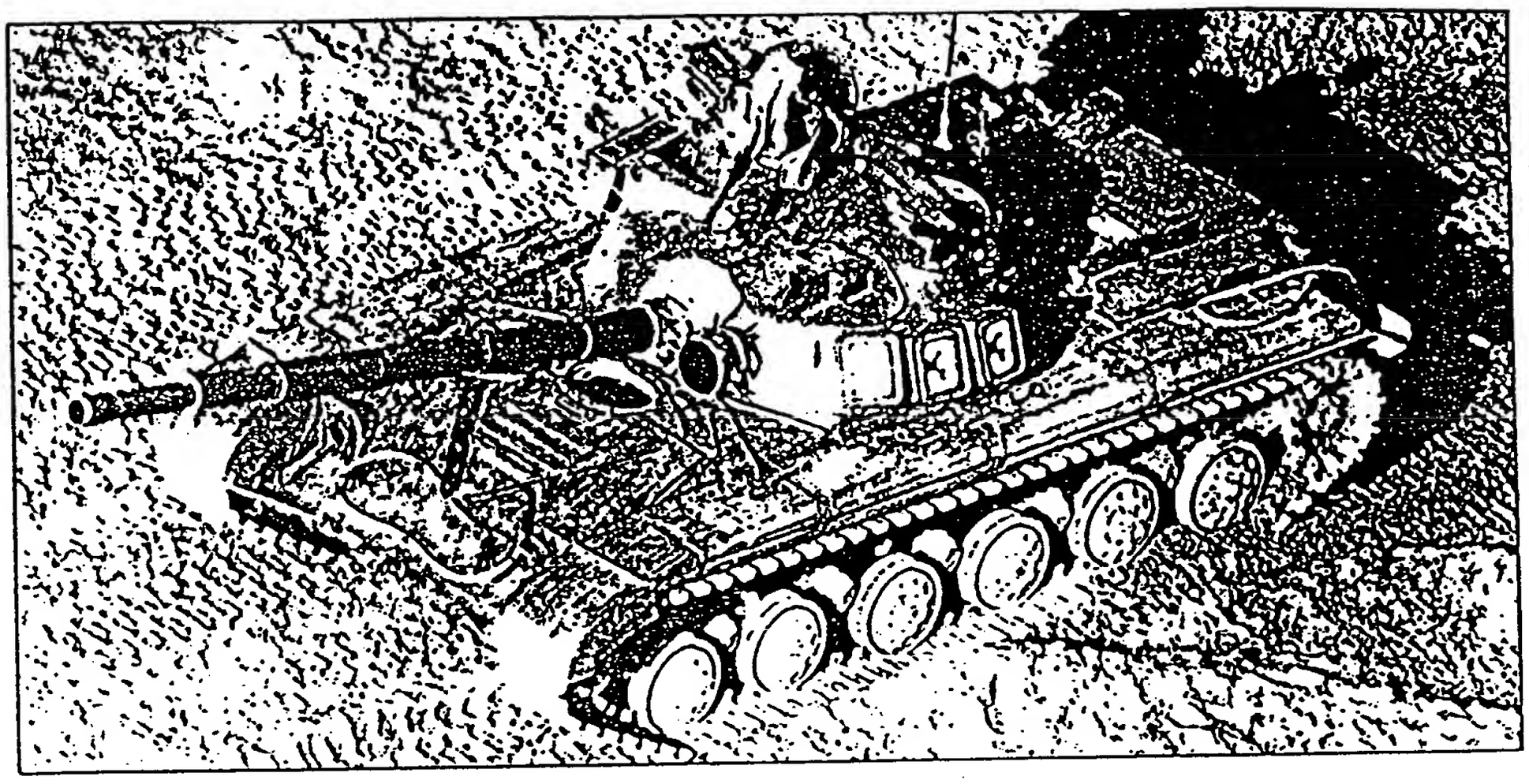
29. The T-64A also has a radiation-absorbing liner to protect the crew against the effects of residual nuclear radiation. This liner will also provide some protection against spalling, which occurs when projectiles striking the armor envelope cause small chunks of metal—spall—to break away from the interior surface of the armor and careen around inside the tank at high velocity, damaging the tank and possibly killing the crew.

30. The T-64A's crew is provided further protection by a collective protection system that automatically senses the presence of radiation or selected chemical and biological agents and, immediately after detection, seals large openings (other than the hatches) into the crew compartment and uses the overpressure there to prevent the introduction of contaminated air. All air for the crew is filtered. The T-64A also has an automatic fire-extinguishing system.

31. In the last few years, Soviet tanks have been fitted with smoke grenade projectors, mounted on the front of the turret. By using these smoke projectors, a tank crew can make it much more difficult for an antitank gunner to acquire the tank as a target, and smoke also degrades the performance of most ATGM guidance systems and laser designator beams. Broadband obscurants could also be dispensed and would substantially degrade thermal imaging systems.

32. ***Armament and Fire Control.*** The T-64A is armed with a high-velocity 125-mm smoothbore gun, which is derived from the T-62's 115-mm gun. This gun is capable of achieving high levels of armor penetration using KE ammunition It can also fire other conventional tank munitions, and, like the T-62's gun, it is stabilized horizontally and vertically. Separated ammunition is fed into the gun with an automatic loader that eliminates the requirement for a human

Figure 2
Soviet T-64A Tank



Weight: 38 metric tons

Armor type: Hull, layered; turret, cored

Armor protection level:
Glacis: 370 to 440 mm against KE (kinetic energy) rounds, 500 to 575 mm against shaped-charge warheads
Turret: 370 to 440 mm against KE rounds, 500 to 575 mm against shaped-charged warheads

Supplemental armor: Standoff skirts

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun

Number of main gun rounds on board: 39

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Coincidence

Engine type: Five-cylinder, opposed-piston diesel

Horsepower: 700 to 750

Power-to-weight ratio (horsepower to metric ton): 18.5-19.7:1

Top speed: 85 km per hour

Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

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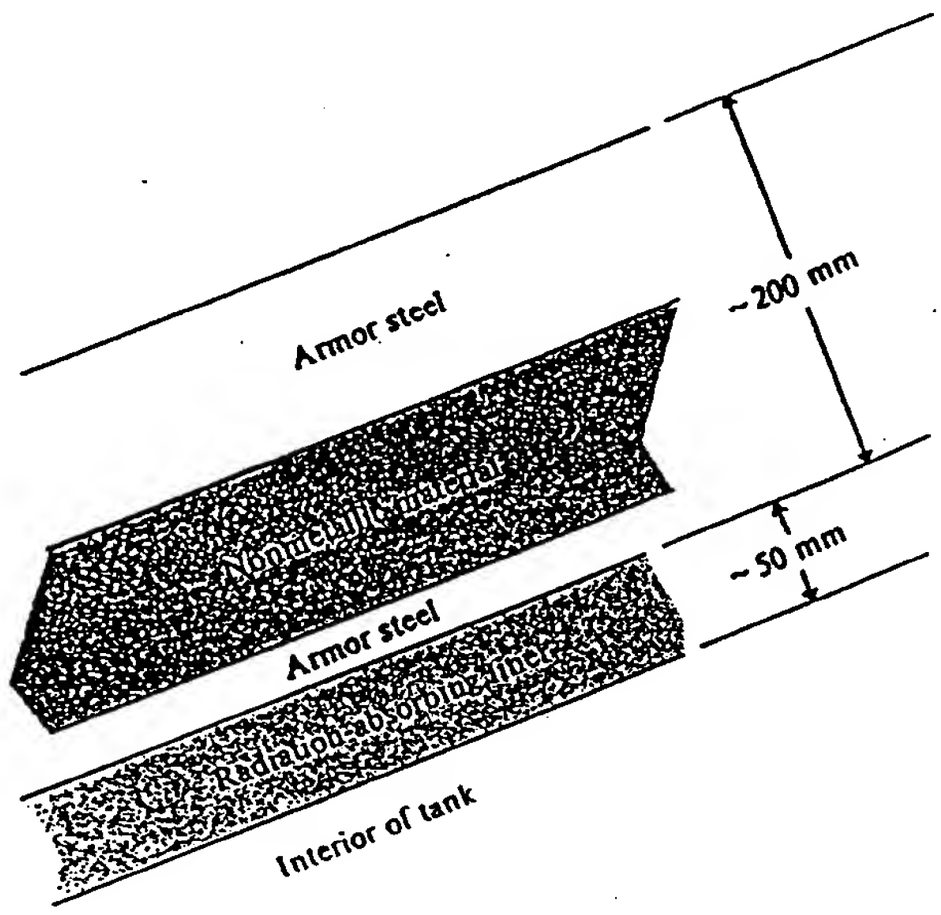
Figure 3
Configuration of Soviet T-72/T-64 Glacis Armor Array



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loader and reduces the crew size from four to three. The use of an automatic loader permits, among other things, a more efficient layout of the commander's and gunner's stations and storage of main gun ammunition below the turret ring. The gun is aimed using a coincidence-rangefinding gunsight which is superior to the T-62's aiming provisions. The fire-control system is partially automated in that the rangefinder feeds range data directly into a ballistic computer, which in turn shifts an aiming mark in the eyepiece to show the gunner the correct elevation of the gun for accurate fire. The gunner uses hand-operated power controls to move the gun to the firing elevation. As the tank approaches a fixed target, the computer can continually adjust the aiming mark to remind the gunner to compensate for the decreasing range.

33. The only aspect of the T-64A's fire-control system that does not represent an improvement over the T-62 is the night vision equipment. Although it was competitive with Western tanks in the late 1960s and early 1970s, now lags far behind contemporary Western capabilities.

34. *Mobility.* The T-64A incorporates an engine radically different from the 12-cylinder diesel that was developed for the T-34 and incorporated with progressive improvements in the T-54, T-55, and T-62. The new engine—a five-cylinder, opposed-piston, diesel model—is lighter and more compact than the V-12 design. Like any other diesel engine, it is technically capable of operating on a variety of fuels, but, when another fuel is substituted for diesel fuel, it will run inefficiently and with less reliability. This new engine gives the T-64A a power-to-weight ratio of between 18.5 and 19.7 horsepower per metric ton, as compared with 16 horsepower per metric ton for the T-55.

35. The T-64A also has a new, manual transmission system that performs much better than the T-62's transmission and steelplate clutch system while avoiding the complexities and the efficiency losses associated with a fully automatic transmission.

36. The T-64A's track and suspension system are more complex than the first postwar tanks' suspension and flat track and makes the T-64A capable of much smoother, faster cross-country travel. The new system includes support rollers, additional shock absorbers, and a double-pin, bushed, live track. These features make the T-64A a more stable gun platform while firing on the move. The track and the suspension system are still vulnerable to mines, however, and even a relatively small mine is capable of immobilizing the tank. This vulnerability extends to all other Soviet medium tanks.

37. *Communications.* The T-64A is equipped with an R-123M radio set, which has a range of 20 km with its whip antenna fully extended. The tank commander can use it to communicate with other tanks in his platoon or company, although extensive use is made of hand signals and signal flags to help preserve radio silence. Commanders of T-64–equipped battalions and regiments are provided with a variant called the T-64K, which is equipped with a second radio called the R-130M, whose range is 50 km. Normally, the company commander receives messages from the battalion or regimental commander via radio and then transmits them in turn to the tanks in his company. The company commander also is usually the only one who transmits messages up the chain of command. Each tank also is equipped with an R-124 intercom for communication between members of the crew. To the best of our knowledge, all tanks of the second post–World War II design generation are equipped with the same communications gear as the T-64 series.

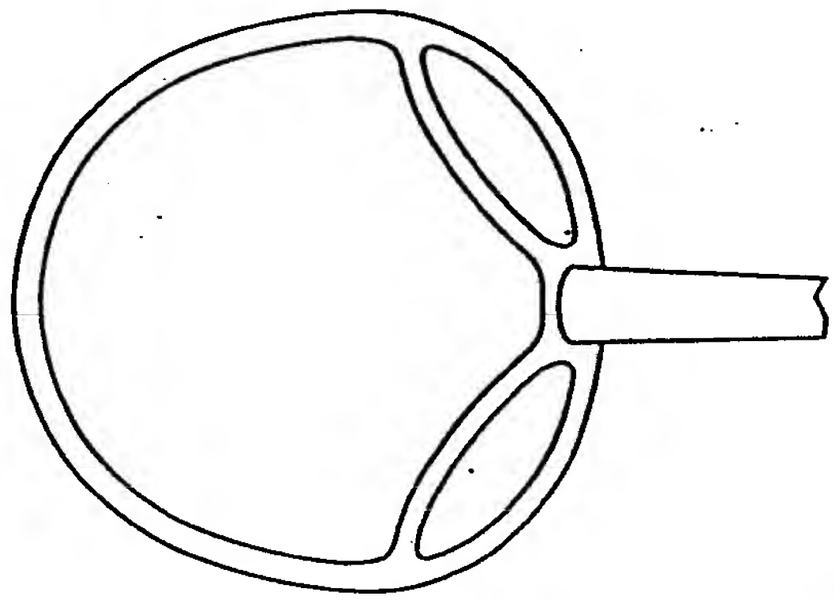
T-64B

38. The T-64B is a further development of the T-64A. It is distinguished chiefly by its ability to fire both ATGMs and conventional ammunition through its 125-mm main gun—which, although it has a developmental designator different from that of the gun of the T-64A and the basic T-72, is externally indistinguishable from that 125-mm gun model (see figure 8, page 17). We assess the ATGM, designated by NATO as the AT-8, to have a maximum range of 4,000 to 5,000 meters and an ability to penetrate 700 to 800 mm of rolled homogeneous armor (RHA). The missile also can be employed in a self-defense role against helicopters and possibly against slower flying tactical aircraft.

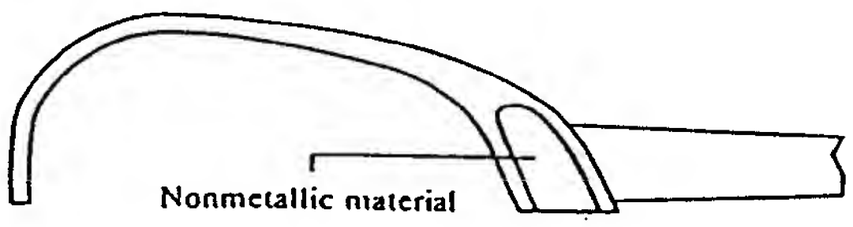
39. This missile-firing capability gives the T-64B greater tactical flexibility than the T-64A. In the attack it could perform more effectively than the A model in an overwatch role. Overwatching tanks deploy for an attack well behind the leading tanks and fire over them to suppress antitank fire. Recent Soviet military publications envision the use of ATGMs for just this sort of fire suppression. In the defense, the

Figure 5
Reported Configuration of
Soviet T-64 Series' Cored
Turret Armor Array

Top View



Side View



Note: Not drawn to scale

T-64B could fight from well-situated positions with extended fields of fire and use its missiles to destroy enemy vehicles at much greater ranges than could a T-64A.

40. The T-64B's fire-control system differs substantially from the A model's. Apparently it incorporates optical components and a laser rangefinder to control fire of conventional tank rounds as well as components to track the missile's infrared beacon and guide its flight with radio commands. The missiles may replace or supplement the five or six high-explosive antitank (HEAT) rounds that normally make up part of a T-64A's ammunition load and are fed into the gun by the automatic loader.

41. Externally, the B model lacks a right-hand optic tunnel and optical rangefinder head on its turret. Instead, it mounts an armored box that houses the radiofrequency antenna for the guidance of the missile. The gunner's sight housing is much larger than that found on the A model. These features, plus the presence of smoke grenade projectors and rubberized side skirts, constitute the chief differences in appearance between the A and B models. At normal battle ranges, the two models would be virtually indistinguishable.

42. T-64Bs recently sighted in northern East Germany have additional armor. Some have been observed with a layer of additional armor bolted both to the forward hull roof and to the top, sides, and rear of the turret. The composition of this armor, which appears to be about 25 mm thick, is not known, but, whether it is armor steel, ceramic, or glass-reinforced plastic, it will significantly increase the tank's protection against smaller antitank weapons that are designed to hit tanks from above and will at least marginally increase radiation protection. Two other T-64Bs were seen in October 1984 with reactive armor boxes mounted on the hull front, on the top, front, and sides of the turret, and on the side skirts [redacted][1] The reactive armor boxes mounted on the turret top

[1] A reactive armor box incorporates an explosive charge which, when detonated by an incoming round, drives a metal plate into the penetrating weapon. This armor is particularly effective against shaped-charge rounds.

appeared to be mounted over the new turret applique armor. The reactive armor will significantly increase protection against shaped-charge warheads. We cannot precisely calculate the effectiveness of this reactive armor without further information.

43. T-64Bs previously sighted in East Germany do not appear to have additional armor, indicating that the Soviets are in the early stages of a program designed to provide their tanks with better protection against NATO ground-launched ATGMs and top-attack weapons and antitank munitions that would be delivered by helicopters and fixed-wing aircraft. Eventually, frontline tanks fielded before 1984 probably will be retrofitted with this additional armor.

44. We assume that the T-64B's basic hull and turret armor is the same as that of the T-64A. Likewise, we assume that the two models incorporate the same engine.

45. Some T-64s have been observed with Soviet units in Hungary that exhibit some but not all of the T-64B's external characteristics. Like the B model, they lack a right-hand optic tunnel and incorporate an enlarged gunner's sight. Unlike the T-64B, however, they do not have an armored box on the front right-hand side of the turret. These tanks may be T-64Bs that have not yet been fitted with armored boxes containing the missile guidance antenna or may represent an improved version of the T-64A having a laser rangefinder and other fire-control modifications.

T-72 Series

46. The T-72 series, which has been produced in a number of variants, is the second member of the

Figure 8
Soviet T-64B Tank

Weight: 38 metric tons

Armor type: Hull, layered; turret, cored

Armor protection level:
Glacis: 370 to 440 mm against KE (kinetic energy) rounds, 500 to 575 mm against shaped-charge warheads
Turret: 370 to 440 mm against KE rounds, 500 to 575 mm against shaped-charge warheads

Supplemental armor: Standoff skirts (some tanks observed with applique top armor also, at times apparently with reactive armor as well)

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun and cannon-launched ATGM (antitank guided missile)

Number of main gun rounds on board: 39

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Laser

Engine type: Five-cylinder, opposed-piston diesel

Horsepower: 700 to 750

Power-to-weight ratio (horsepower to metric ton): 18.5-19.7:1

Top speed: 85 km per hour

Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

Secret

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second postwar generation of Soviet tank designs. Among the several variants, we generally recognize three principal versions: one with an optical coincidence rangefinder and another two with a laser rangefinder. We call these three the T-72, the T-72M, and the Soviet medium tank M-1981/3, respectively. We do not understand why in the space of a few years the Soviets developed and produced two distinctly different tank designs—the T-72 and the T-64—that they apparently consider equally effective in combat.

T-72

47. The basic T-72 (see figure 9) has been seen serving with Soviet units, non-Soviet Warsaw Pact (NSWP) units, and various Third World armies. Externally, the domestic and exported versions appear to be identical, although we cannot dismiss the possibility that the domestic version has superior capabilities.

48. ***Protection.*** The T-72's glacis armor reportedly is similar in configuration to the T-64's, but we assess its protection level to be less because of a difference in materials. [redacted]

[redacted]

49. The T-72's turret armor is composed of solid, cast steel that probably provides better protection against KE rounds than the T-64's turret armor, but less protection against shaped-charge rounds. [redacted]

Like the T-64 series, the T-72 series is also fitted with an NBC collective protection system and an automatic fire-extinguishing system.

50. ***Armament and Fire Control.*** The T-72 mounts the same high-velocity, horizontally and vertically stabilized, 125-mm smoothbore gun as the T-64A and uses a different automatic loader that contains six fewer rounds than the T-64A's. This loader feeds separated ammunition into the gun, thus eliminating the requirement for a human loader and reducing the crew size from four men to three. The T-72's fire-control system, including the night firing capability, is nearly identical to that of the T-64A.

51. ***Mobility.*** In contrast to the T-64 series' innovative engine design, the T-72 series uses a V-12 diesel that is a direct, although modified and improved, descendant of the T-34's engine. This supercharged engine produces enough power to give the T-72 a power-to-weight ratio of 19.1 horsepower per metric ton, as compared with the T-64A's 18.5 to 19.7. However, while nearly as mobile as the 38-metric-ton T-64A, the T-72 cannot quite match the T-64A's acceleration and overall agility.

T-72M

52. In 1980, we observed the T-72M, which has an enlarged gunner's sight housing but no right-hand optic tunnel and incorporates a laser rangefinder (see figure 10, page 20). This tank also has full-length rubberized side skirts and several smoke grenade projectors attached to the turret face. The smoke grenade projectors were probably developed to counter improved Western antitank weapon target acquisition and guidance systems. Otherwise, this tank appears to be virtually identical to the T-72. The Soviets reportedly began producing T-72Ms and assigning them to army units as early as 1977, although this has not yet been confirmed.

53. We assess the T-72M's armor protection and automotive performance to be the same as the T-72's. We assume that the T-72M that may have been issued to Soviet troops does not differ significantly in its capabilities from the exported version.

54. The T-72M probably is the T-72 variant being produced by the Czechoslovaks and the Poles for fielding with the Soviets' Warsaw Pact allies. By 1983 this variant apparently had been exported outside the Pact to India, Iraq, Syria, and Yugoslavia.

Soviet Medium Tank M-1981/3

55. In November 1981 the Soviets paraded a T-72 variant that, like the T-72M, has no right-hand optic tunnel or optical rangefinder head on its turret (see figure 11, page 21). It also appears to have thicker turret and glacis armor, and, like the T-72M and the T-64B, it is fitted with rubberized side skirts and smoke grenade projectors. It also is slightly longer than

Figure 9
Soviet T-72 Tank

Weight: 41 metric tons

Armor type: Hull, layered; turret, cast steel

Armor protection level:
Glacis: 350 mm against KE (kinetic energy) rounds, 450 mm against shaped-charge warheads
Turret: 450 mm against KE rounds, 450 mm against shaped-charge warheads.

Supplemental armor: Standoff skirts

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun

Number of main gun rounds on board: 39

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Coincidence

Engine type: 12-cylinder diesel

Horsepower: 780

Power-to-weight ratio (horsepower to metric ton): 19.1:1

Top speed: 60 km per hour

Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

Secret

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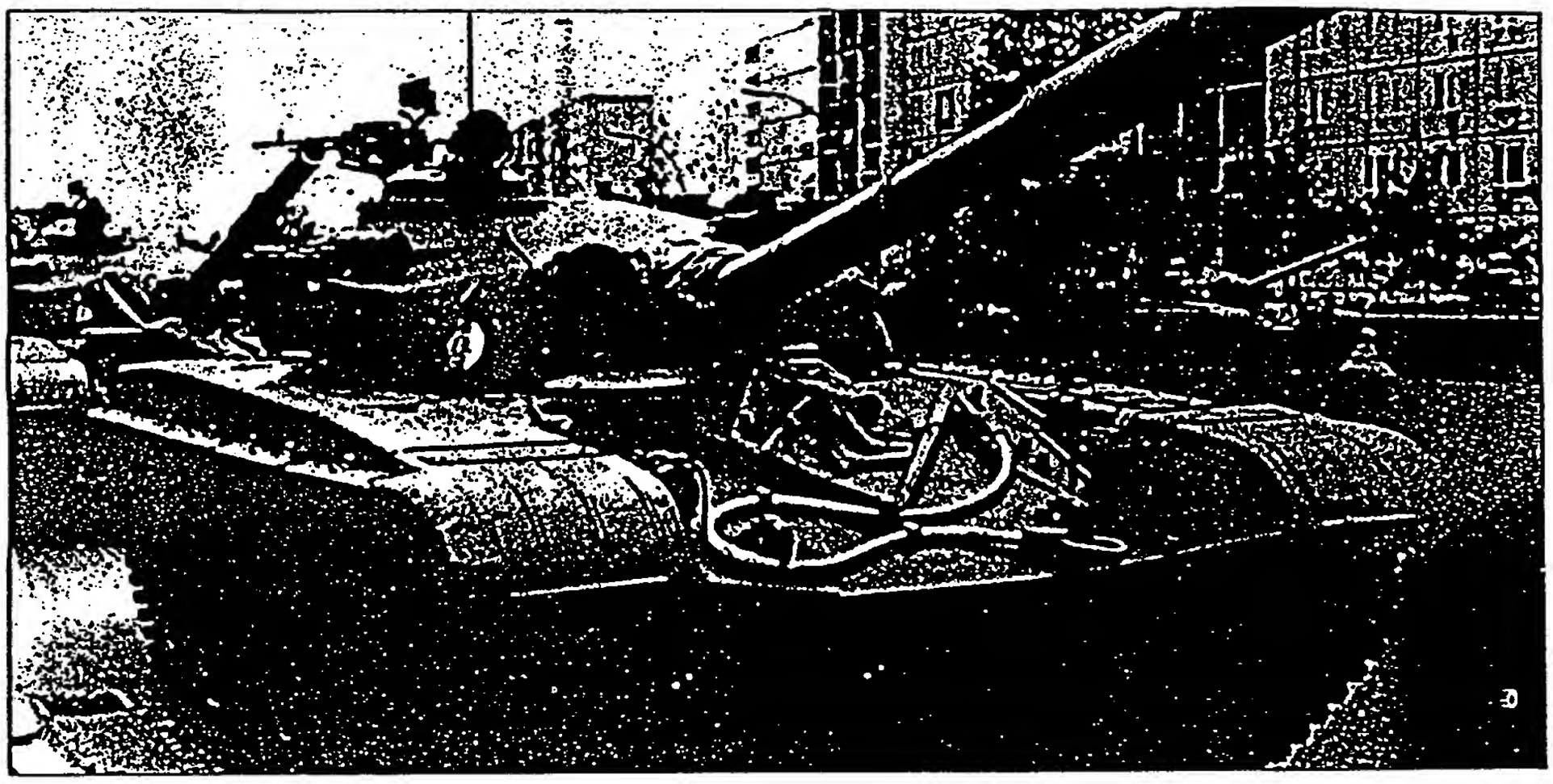
Figure 10
Soviet T-72M Tank
(Shown Here in East German Army Markings)



Weight: 41 metric tons

Armor type: Hull, layered; turret, cast steel

Armor protection level:
Glacis: 350 mm against KE (kinetic energy) rounds, 450 mm against shaped-charge warheads
Turret: 450 mm against KE rounds, 450 mm against shaped-charge warheads

Supplemental armor: Standoff skirts

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun

Number of main gun rounds on board: 44

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Laser

Engine type: 12-cylinder diesel

Horsepower: 780

Power-to-weight ratio (horsepower to metric ton): 19.1:1

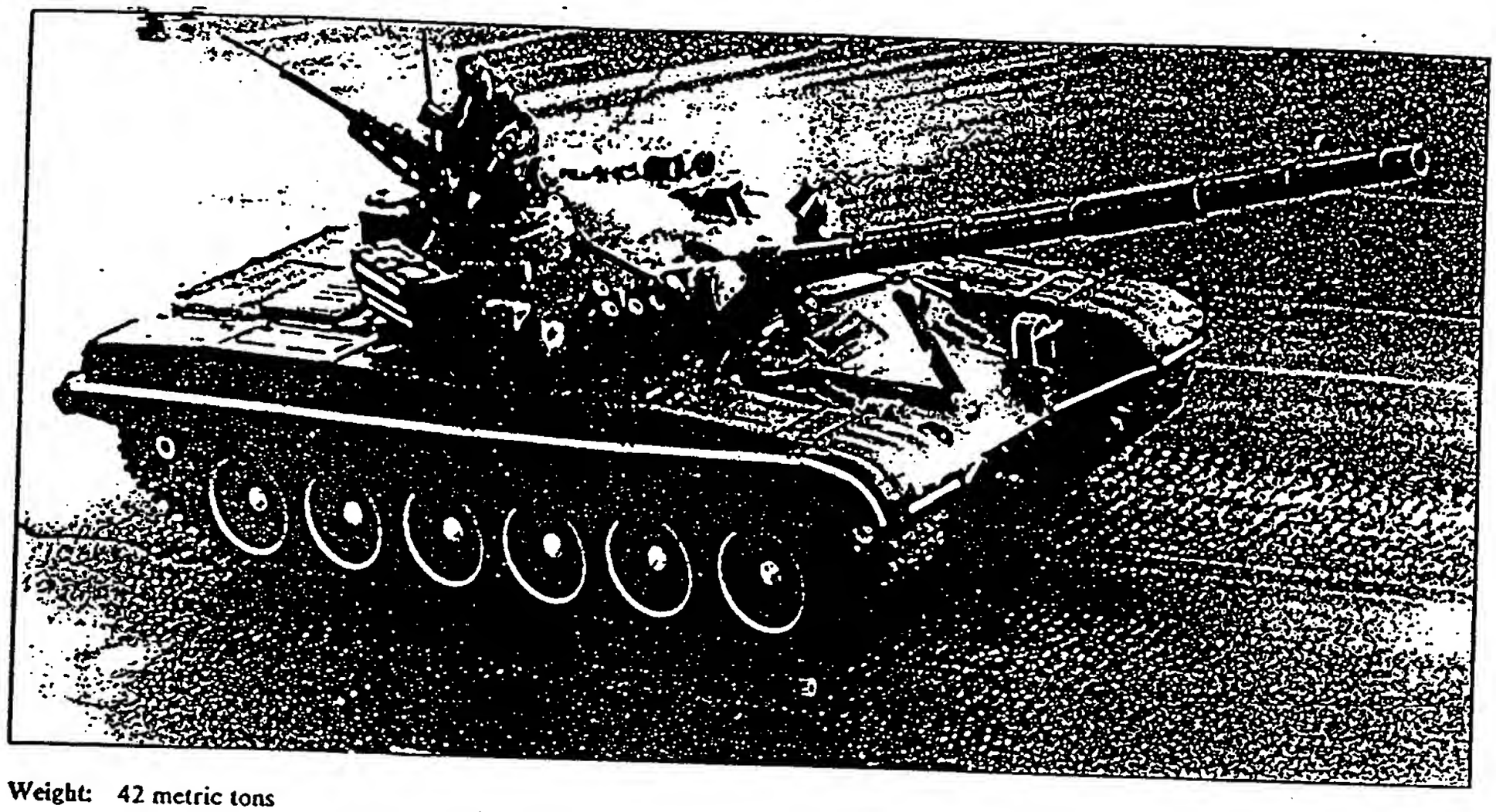
Top speed: 60 km per hour

Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

Figure 11
Soviet Medium Tank 1981/3



Weight: 42 metric tons

Armor type: Hull, layered; turret, cored/layered

Armor protection level:
Glacis: 400 to 450 mm against KE (kinetic energy) rounds, 450 to 500 mm against shaped-charge warheads
Turret: 500 mm against KE rounds, 650 mm against shaped-charge warheads

Supplemental armor: Standoff skirts

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun

Number of main gun rounds on board: 44

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Laser

Engine type: 12-cylinder diesel

Horsepower: 850

Power-to-weight ratio (horsepower to metric ton): 20.2:1

Top speed: 60 km per hour

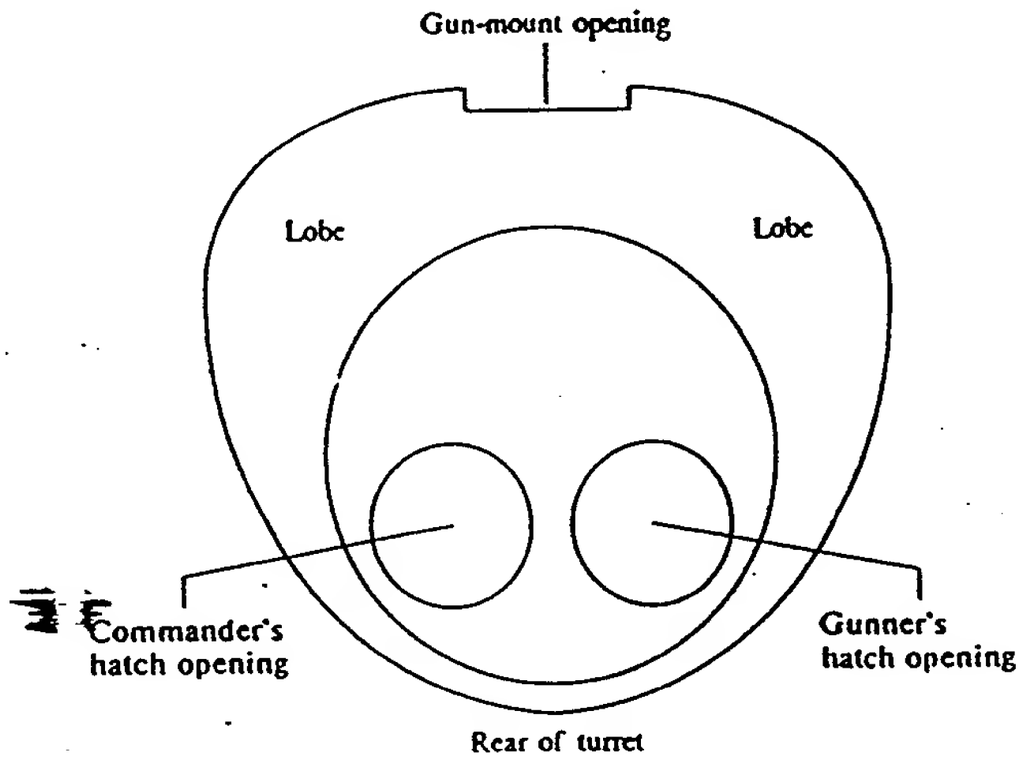
Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

56. *Protection.* We assess that the M-1981/3's thickened glacis:

57. The armor on the front of the turret also appears to have been thickened. It is unclear whether the additional armor consists solely of cast steel or incorporates a layer of nonmetallic material as the T-64–series turret reportedly has.



58. Like the T-72M and the T-64B, the M-1981/3 has a radiation-absorbing liner, has full-length, rubberized side skirts, and has rubber shields for the external fuel tanks. It also has smoke grenade projectors mounted on the turret front.

59. *Armament and Fire Control.* The M-1981/3 is armed with a 125-mm smoothbore gun, which is basically the same as the gun mounted on the T-64 and other T-72–series tanks, although it may be marginally improved in its resistance to barrel wear. The M-1981/3's fire-control system probably is at least as good as the T-72M's. The M-1981/3 probably has a laser rangefinder and a ballistic computer different from that of the basic T-72, but its night vision devices do not appear to be significantly different. In addition, the main searchlight may be more powerful. Another possible improvement is an automatic loader that feeds ammunition to the gun faster. There is no evidence that this tank can fire ATGMs through its main gun.

60. *Mobility.* The M-1981/3 incorporates the same engine deck configuration as the basic T-72 and the T-72M, strongly suggesting that it is powered by the same diesel engine as these older models. Further improvements in the supercharger could boost the engine's output, however, and give the 42-metric-ton M-1981/3 a power-to-weight ratio of about 20 horsepower per metric ton. The M-1981/3 almost certainly uses the same transmission as earlier models.

the T-72 and the T-72M. The Four Powers have designated this tank the Soviet medium tank (SMT) M-1981/3. Regardless of this tank's T-number, it is a highly refined T-72 designed to counter the latest Western antitank weapons.

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T-80

61. In the spring of 1983 a group of tanks of a new type were seen with a Soviet unit in East Germany (see figure 13, page 24). We now know this tank is the T-80.

62. *Protection.* The T-80's glacis armor probably is similar in design to that of the T-72 and T-64 series and incorporates a layer of nonmetallic material between layers of steel. We assess that this array provides the same protection against KE rounds as the glacis of the M-1981/3, but better protection against shaped-charge rounds.

The T-80's turret armor may incorporate cavity armor similar to that attributed to the T-64 series, but this has not been confirmed. We assess that this turret armor array provides the same level of protection as the turret armor of the M-1981/3.

63. *Armament and Fire Control.* The T-80, like the T-64B, can fire an ATGM through its main gun as well as standard tank gun projectiles. Both tanks probably also will be able to fire a newer ATGM when it becomes available—probably during the next two or three years. This missile-firing capability would give the T-80 the same tactical versatility that we attribute to the T-64B. We believe that the T-80 and the T-64B share virtually identical fire-control systems.

64. *Mobility.* The T-80 is powered by a gas turbine engine with a peak power output of about 1,000 to 1,200 horsepower. It also is probably equipped with a variable-height suspension, which would contribute to giving the T-80 better cross-country mobility than any other fielded Soviet tank. This feature also helps overcome a traditional weakness in Soviet tank design: restricted main gun depression. A diesel engine version of the T-80 may exist, but as yet we have not positively identified it in Soviet units.

65. The T-80 is being fielded currently with Soviet units in southern East Germany. This assignment to units in the forward area follows service in selected tank units in the USSR at least since 1981.

Tank Modernization Programs

66. The Soviets and their Warsaw Pact allies appear to be planning thorough modernization of sizable numbers of T-54s, T-55s, and T-62s instead of replacing them with newly produced tanks. This approach will save substantial amounts of money: a T-55 or T-62 could be modernized for the estimated dollar equivalent cost of $350,000. The latest model tanks cost the equivalent of $1-1.4 million. The modernized Soviet tanks probably will be assigned to units opposite China, Afghanistan, and Iran and should be a match for any potential enemy tank in that area during the next two decades. The modernized NSWP tanks presumably will incorporate the same improvements as the modernized Soviet tanks.

67. Although the Soviets have always funded modest tank modernization programs, the current modernization effort entails extensive improvements and is, therefore, fundamentally different from past programs.

Armor

68. The T-62s appear to be receiving additional armor on the glacis and noseplate, and the front and top of their turrets. (See figure 14, page 25). The T-55s probably will be similarly upgraded. Unfortunately, we cannot meaningfully estimate the increase in protection that this will provide until we have closely observed these modernized versions. Modernized tanks also probably will be equipped with side skirts.

Armament and Fire Control

69. We expect that most of the modernized T-54s, T-55s, and T-62s will retain their original guns, but we cannot rule out the possibility that the Soviets will equip at least some of them with newly designed main guns. We cannot discount the possibility that at least some of these tanks may also be equipped to fire ATGMs. The fire-control systems of all these tank models probably will be considerably improved by replacing the original equipment with systems that include a laser rangefinder. Other possibilities include an improved main gun stabilization system, an electronic ballistic computer, and a more powerful infrared searchlight.

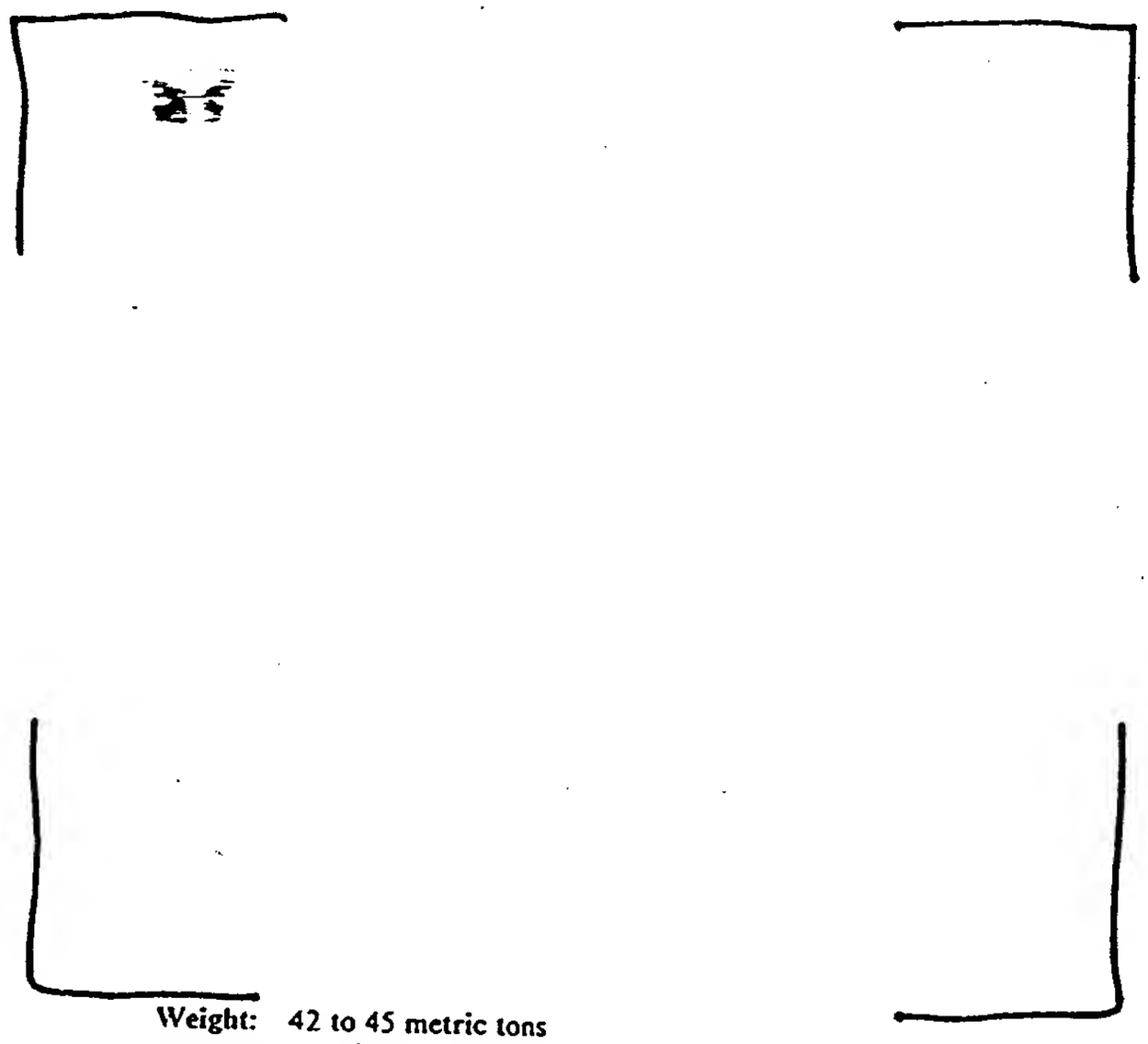
Mobility

70. The additional weight of the extra armor necessitates an increase in engine power if the modernized tanks are to maintain or improve their previous mobility. The Soviets may also refit these older tanks with the track of the T-72 to enhance cross-country mobility and service life.

Future Soviet Tank Programs

71. Although some influential defense officials, including Marshal Ogarkov, have called for intense scrutiny of the future military value of the tank, the Soviet army appears to be firmly wedded to the tank

Figure 13
Soviet T-80 Tank



Weight: 42 to 45 metric tons

Armor type: Hull, layered; turret, unknown

Armor protection level:
Glacis: 440 to 450 mm against KE (kinetic energy) rounds, 500 to 575 mm against shaped-charge warheads
Turret: 500-mm against KE rounds, 650-mm against shaped-charge warheads

Supplemental armor: Standoff skirts

NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner

Main armament: 125-mm smoothbore gun and cannon-launched ATGM (antitank guided missile)

Number of main gun rounds on board: 39

Type of loader: Automatic

Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun

Main gun stabilization: Two-plane

Type of rangefinder: Laser

Engine type: Gas turbine

Horsepower: About 1,000

Power-to-weight ratio (horsepower to metric ton): 22.2-23.8:1

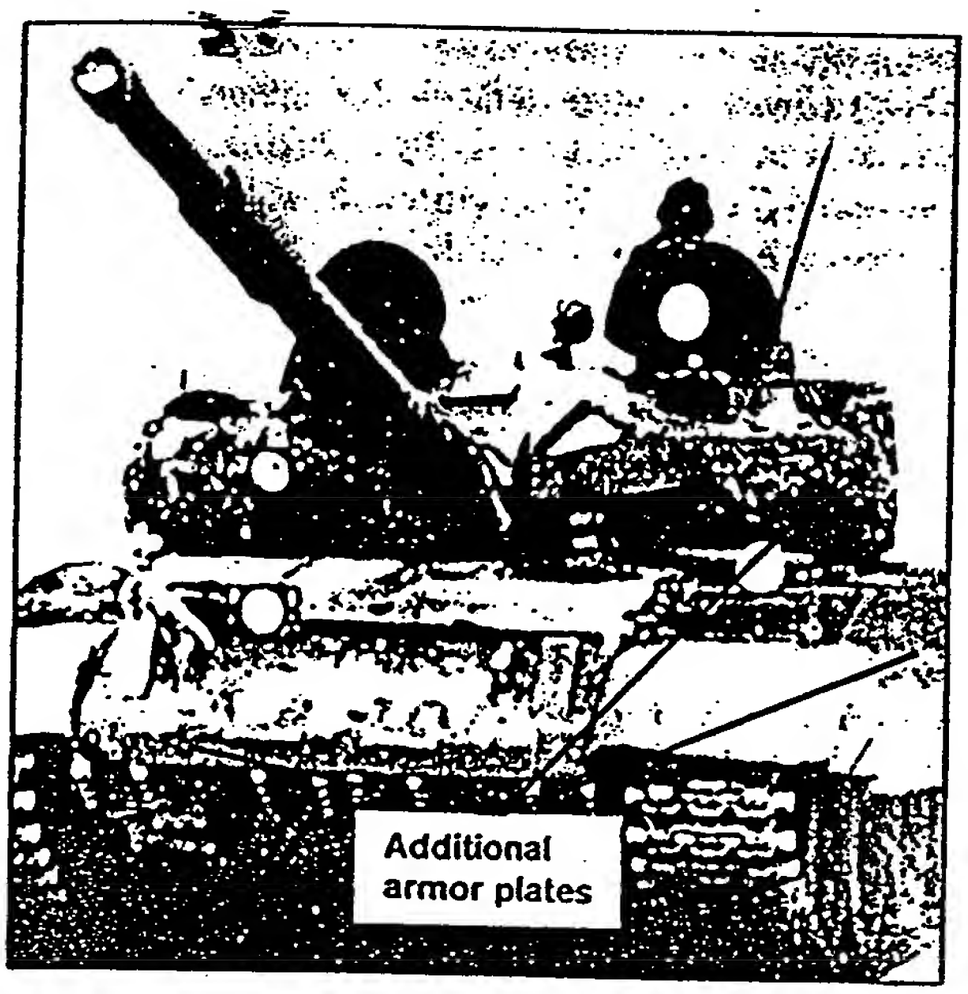
Top speed: 85 km per hour

Maximum cruising range: 600 km with auxiliary fuel tanks, 450 km without

Radio: R-123M (range 20 km with squelch off)

Crewmen: Three

Figure 14
Modernized Soviet T-62 Tank



Weight: 39 metric tons
Armor type: Hull, welded steel with applique; turret, cast steel with applique
Armor protection level: No estimate available
Supplemental armor: Standoff skirts
NBC (nuclear, biological, chemical) protection: Collective protection system and radiation liner
Main armament: 115-mm smoothbore gun and possibly ATGM (antitank guided missile)
Number of main gun rounds on board: 40
Type of loader: Human
Auxiliary armament: 7.62-mm coaxial machinegun, 12.7-mm turret-mounted machinegun
Main gun stabilization: Two-plane
Type of rangefinder: Laser
Engine type: 12-cylinder diesel
Horsepower: 640 to 690
Power-to-weight ratio (horsepower to metric ton): 16.4-17.7:1
Top speed: 60 km per hour
Maximum cruising range: 650 km with auxiliary fuel tanks, 450 km without
Radio: R-123M (range 20 km with squelch off)
Crewmen: Four

as the principal element of its combined-arms force. The aggregate working area of known RDT&E-related facilities is expanding and appear active. If Western efforts to stem the flow of weapons-related technology to Warsaw Pact countries are successful, we anticipate that Soviet RDT&E efforts will increase even more.

72. The Soviets have every reason to develop a distinctly new, more capable design. Although the T-64B, the SMT M-1981/3, and the T-80 went into serial production in the early 1980s, at best they represent the technology of the mid-1970s. They do not appear to be adequate to the task of reliably countering the variety of new, potent NATO antitank systems that will be fielded later in this decade.

73. Because we do not have a clear picture of individual Soviet tank RDT&E programs, we must take a rather circuitous approach to predicting the capabilities of future Soviet tank models. First, we examine the capabilities of US antitank weapons that Soviet tanks would have to engage in a general war in the late 1980s or early 1990s.[a] If we assume that the Soviets have fairly accurate information about these weapons, we can conclude that they will strive to develop tanks that are capable of defeating a vast majority of these threats. Finally, we can assess the current state of relevant Soviet tank-related technologies in an attempt to estimate the Soviets' ability to develop such a design or designs.

The Challenge of Future Antitank Weapons

74. US antitank weapons that are already entering or should soon enter the inventory present Soviet tank designers with a difficult challenge (see annex B, pages 49-50). The US Army's M-1A1 tank will be armed with a potent 120-mm KE round. The shaped-charge warheads of the TOW 2 and the Hellfire ATGM, which is designed to be fired from the AH-64 attack helicopter, are highly lethal and have long ranges. Various new or improved antitank weapons are designed to attack the relatively thin armor on the hull and turret top. In addition, newly developed mines pose a "bottom attack" threat.

75. All of these weapons probably were designed to engage any currently fielded Soviet tank without resort to a flank attack. This poses a serious problem for the Soviet operational planner, who is concerned with maintaining a high rate of advance in any Warsaw Pact offensive operation in a general war with NATO.

[a] We do not assess the performance of future non-US NATO antitank weapons here. We assume that none of these weapons will be substantially more capable than their US counterparts.

Initial Soviet Response

76. The Soviets appear to have begun to respond to these developing threats, especially in the areas of add-on armor and countermeasures. Soviet tanks are now being fitted with smoke grenade projectors, presumably to make it more difficult for enemy antitank weapons to hit their targets. By reducing the tank's radar and infrared (IR) signatures, the rubberized side skirts on the latest Soviet tanks impede the ability of enemy target acquisition sensors to discover the vehicles. Exhaust baffling and engine heat deflection also contribute to IR signature reduction. Moreover, we believe that the latest Soviet tanks may be coated with paint that makes it more difficult for IR target acquisition devices to distinguish the tanks. Reportedly, the Soviets also are fielding turret-mounted devices to disrupt selected ATGM guidance systems. These measures only partially solve the NATO antitank threat to today's Warsaw Pact tank forces, however. We believe they do not meet the future threat adequately.

Future Soviet Tank Development Options

77. The Soviets' response to this future challenge to their tank force could take one of several forms. For instance, they could choose not to continue to develop medium tanks. They could decide to substitute mobility for protection and field large numbers of small, lightly armored vehicles that are capable of high cross-country speeds while still mounting a relatively large, powerful main armament. This solution has been tried before in the West and to date has always proved unsatisfactory. We believe the Soviets share the belief that mobility is a poor substitute for adequate armor protection. We believe that the Soviets are well aware of this and would not choose this option.

78. Another option would entail the rejection of the main battle tank concept and a return to a force mix made up of medium and heavy tanks, and possibly light tanks as well. Under this concept, very heavily armored tanks would be used to penetrate combat zones that are heavily defended by formidable new antitank weapons. Because of their heavy armor, the heavy tanks would lack the mobility to pursue a fleeing enemy. Thus, it would fall to more lightly armored and faster medium tanks to exploit breakthroughs created by the heavy tanks. The Soviets have devised such tactics before and could do so again.

79. The Soviets also may opt to continue to focus on the development of main battle tanks—tanks designed

to perform the roles previously peformed by light, medium, and heavy tanks—but they might provide them with more armor and more powerful engines that would give them an acceptable level of mobility.

Which Option Will the Soviets Choose?

80. We cannot predict with a high degree of certainty which of these options the Soviets will choose. If for no other reason than that they have concentrated for the last 25 years on the development of main battle tanks, we expect them to continue to develop main battle tanks. This would not prevent them from providing some of these tanks with a longer range firing capability.

81. Clearly, however, if the Soviets do in fact choose to continue to focus on the development of main battle tanks, they must protect these tanks better. They could solve this protection problem in a variety of ways, some of which would not entail any basic redesign of present tanks. They could, for instance, strive to increase incrementally the frontal, top, and belly armor of their tanks and, like the Israelis, supplement it with additional shields, screens, or reactive armor. At the same time, they could add more effective countermeasures and strengthen their combined-arms forces with more units to suppress antitank weapons.

82. It is unlikely that the Soviets would pursue only a stopgap solution to protect the principal element of their combined-arms force. Instead, we anticipate their development of new tanks that incorporate substantially higher levels of integral protection, including liners that would provide increased protection against enhanced radiation weapons. We cannot discount the possibility that they will be able to achieve the necessary levels of protection by developing a traditional, turreted design or designs. If they do, however, they will have to perfect technically advanced armors to provide the required protection without exceeding a 50-metric-ton upper weight limit. Because the Soviets have an extensive basic and applied materials research establishment that does not depend to any significant extent on the transfer of Western technology, they may be able to accomplish this goal.

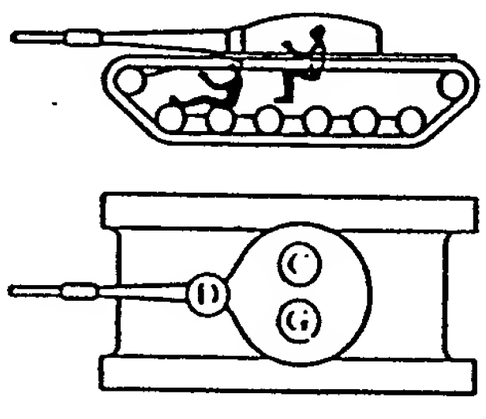
83. The Soviets probably would strive to keep such a design at or near the 50-metric-ton weight limit because tank designs substantially exceeding this limit would require the development of more powerful engines than the Soviets have used in the past. The Soviets reportedly have been developing both high-output diesel and turbine engines since the early 1970s or earlier, but it would be in their interest not to have to produce completely new engine designs. There apparently have been problems with Soviet turbine designs. Reportedly, the Soviets consider these engines too noisy and prodigal in their fuel consumption. The deployment of the T-80 with a turbine engine indicates that the Soviets believe they have lowered noise and fuel consumption to the point of operational acceptability. Nevertheless, the addition of a third external fuel drum to the T-80 supports the thesis that this turbine consumes significantly greater quantities of fuel than a diesel engine of the same power.

84. Reducing the size of the turret or eliminating it altogether might result in a 45-metric-ton design that would have substantially increased protection due to the application of the weight saved from the turret to increased frontal, top, and belly armor and a strengthened suspension that could better resist mines. Such a design, unlike a fully turreted tank, probably would not call for the development of a radically new type of armor, nor would it require a more powerful engine. (See figure 15, page 28.)

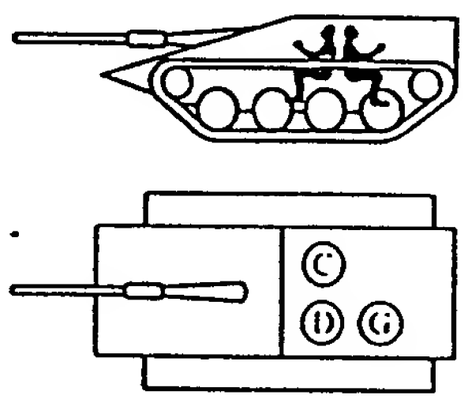
85. Western designers find turretless designs attractive, but such designs require the development of automatic loaders that can reliably handle large-caliber ammunition and fire-control optics or sensors that can rotate with the gun or even independently of it to provide the gunner, who would be seated within the hull, with a 360-degree field of view. Although finding a solution to this vision problem probably would tax the Soviets' engineering skills heavily, the automatic loader requirement would not be a deterrent because Soviet designers have lengthy experience with such loaders.[3]

[3] The Swedes are currently developing a new turretless tank design, and they encountered significant difficulties in providing the gunner with fire-control optics that rotated with the pedestal-mounted gun. Finally, they opted to create a turret basket that allowed the gunner to rotate with the gun while remaining within the hull's armor envelope.

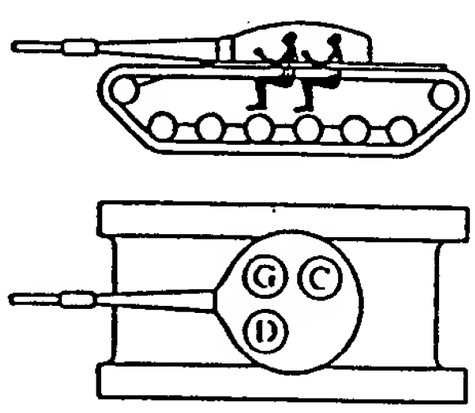
Figure 15
Future Soviet Tank Design Options



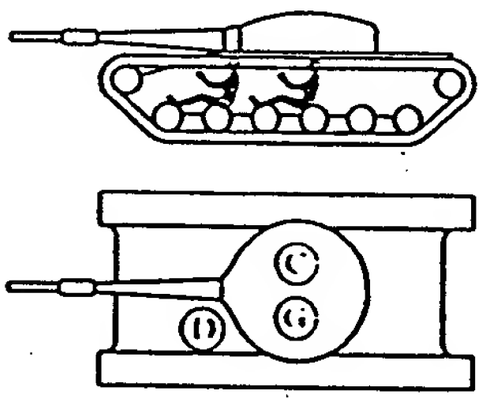
Turret tank with separated placement of crew (driver in hull, commander and gunner in turret)



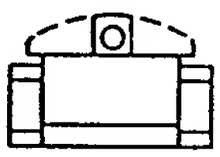
Turretless tank

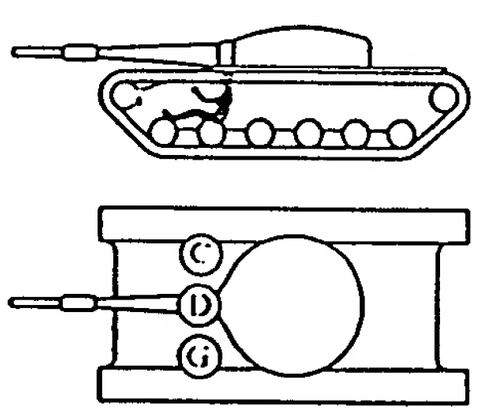


Turret tank with crew in turret



Reduced-volume-turret tank with crew separated (driver in hull, commander and gunner in turret)

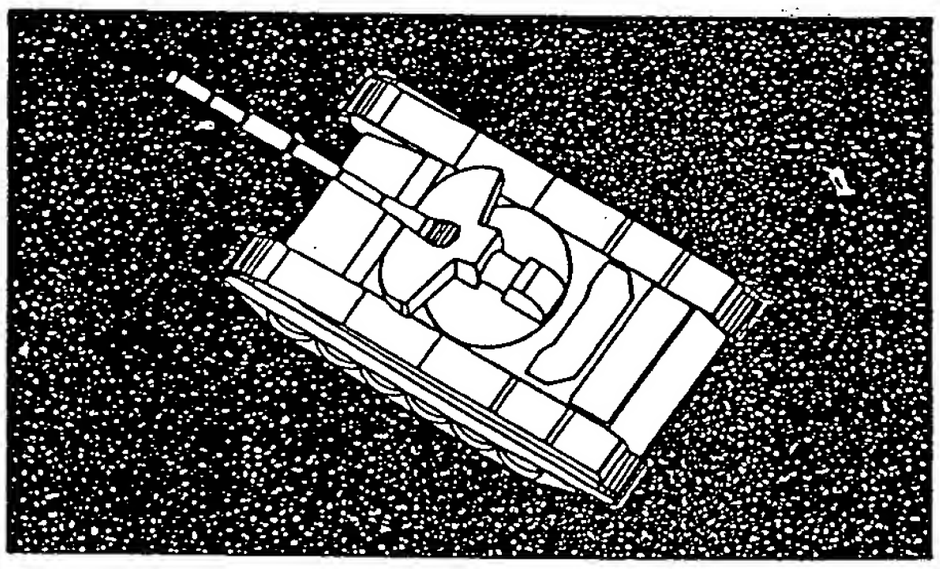




Reduced-volume-turret tank with crew forward in hull

Illustrations from Soviet text depicting selected tank design options

Artist's conception of possible prototype of reduced-volume-turret or elevated-gun tank.



86. The Soviets could opt to follow a two-design strategy as they apparently did with the T-64 and T-72 series. Such an approach would allow them to undertake the development of a higher risk turretless or reduced-volume turret design while also developing a more traditional turreted tank as a backup.

87. Whichever options the Soviets choose—turreted, turretless, or both—they almost certainly will strive to overcome some weaknesses that have been apparent in their current tank generation. Specifically, they almost certainly will continue to improve fire-control systems to decrease target acquisition time. Because of the ballistic performance of their 125-mm gun with its high muzzle velocities and attendant flat ballistic trajectories, the gunnery problems are not as complex as those confronting Western tank designers. Currently, most Western tanks are equipped with a rifled 105-mm gun armed with projectiles of lower muzzle velocities and less flat ballistic trajectories. Consequently, the Soviets probably do not need many of the features that are included in the latest Western fully integrated fire-control systems, such as wind sensors, cant sensors, and muzzle reference systems.

88. We also expect the Soviets to develop improved night vision equipment, either active or passive or a combination of the two. We think it is highly probable that they are striving to develop a thermal imaging system equal in capability to the ones that are used in the M-1 and the M-60A3 tanks. Recent evidence reveals that an airborne thermal imaging system for civilian use incorporating 1970 technology has been developed. An improved thermal imaging technology for use in armored vehicles is certainly practicable. We also expect improvements in stabilization systems for their main armament, and they will also continue to make their automatic loaders even faster and more reliable.

89. The Soviets almost certainly will continue to improve their future tanks' antitank weapon countermeasures and supplemental armors. Moreover, we predict improvements in the tactics, organization, and equipment of the other elements of their combined-arms force in an effort to provide more effective antitank suppression.

Future Development Options and Technology Transfer

90. We believe that the Soviets can and will develop and produce tanks to suit their future operational requirements. The embargo on the transfer of US technology to the USSR will not cripple Soviet tank development programs. Although Soviet tank developers have exploited Western technology in many significant ways, they have not been dependent on it. In fact, the Soviets have frequently led the West in fielding advanced armored-vehicle-related technology such as infrared night vision equipment, automatic loaders, long rod penetrator KE ammunition, and nuclear, biological, and chemical detection and protective systems.

91. Weapons that make extensive use of sophisticated electronic components, such as tactical aircraft, owe more to Western technology than weapons like tanks. Still, certain Western technologies, which the Soviets have acquired both legally and illegally, probably have shortened the time necessary to develop certain key tank components and have reduced associated development costs. If the technology embargo persists, the time necessary for the development of new tank designs probably will lengthen and costs will rise.

92. In the past the Soviets probably had access to detailed information about early US experiments with laminate and composite armors. This access would have facilitated their development of these types of armor. Similarly, recent Soviet patents covering a high-output diesel engine with potential military applications strongly suggest that the Soviets are intimately familiar with French research in this area. However, we have no direct evidence that the Soviets have been dependent on US or Western technology for the development of key tank components.

Technology Transfer and the Challenge to Tank Producers

93. Certain aspects of these future design options probably will strain Soviet tank production capabilities, just as they have strained Western tank manufacturers (see section C, on tank production, beginning at paragraph 95). Generally, Soviet designers create capable weapons, but often Soviet weapon producers have difficulty developing manufacturing technology that enables them to translate these designs efficiently into production versions. In the past this has not been as much of a problem for the manufacturers of tanks because these weapons did not make extensive use of sophisticated electronic components. In the future, tank producers will increasingly have such difficulties. They already have problems manufacturing delicate electronic and electro-optical subcomponents integral to fire-control systems. The greater emphasis on the

development and manufacture of improved fire-control systems and countermeasures to antitank weapons will aggravate these problems. The Soviets are even beginning to experience difficulties in areas in which they have been masters, such as metalworking. For example, turret casting operations at Nizhniy Tagil have been running into trouble, although these problems may actually involve difficulties in combining ceramic armor with cast steel armor.

94. Soviet fabrication technology has lagged behind the West's in some areas, and the Soviets have tried to overcome this gap in capabilities by purchasing a variety of sophisticated Western machine tools to be used in the tank production process. These machine tools should enable the Soviets to cut and weld steel to fine tolerances faster and with fewer workers than they could previously. The acquisition of these tools should also reduce the time needed to prepare for the production of a new model.

C. TANK PRODUCTION

95. The Soviets maintain the world's largest tank fleet and have a correspondingly large production capability to support it. There are about 50,000 tanks in the inventories of active army units; and several thousand more tanks serve as training vehicles, maintenance float vehicles, and war reserve weapons. In addition, the Soviets export substantial numbers of newly produced tanks.

96. Because ground weapons technology has advanced steadily since World War II, the Soviets have had to replenish their huge tank force constantly with new tank models to keep it from becoming obsolescent. This requirement has led to a major research and development program and the construction of an extensive production establishment that has supported a high annual tank production rate—an estimated average of about 3,000 vehicles a year for the last 10 years. This high rate of production has enabled the Soviets to keep their tank force opposite NATO equipped largely with modern, highly capable vehicles.

97. The future Soviet requirement for tanks will increase as the Soviet army expands from its current size of about 215 divisions to a projected total of about 240 by the year 2000.[4] Because of the high cost of procuring large numbers of increasingly complex and expensive tanks, the Soviets apparently plan to meet part of this requirement by modernizing substantial numbers of T-54s, T-55s, T-62s, and early-model T-72s. Even so, they will have to continue to produce large numbers of new tanks every year for at least the rest of the century.

[4] This projection is part of a formally coordinated CIA-DIA-Army assessment of the order of battle, organization, and equipment of future Warsaw Pact ground forces.

Figure 16
Major Soviet Tank Assembly Plants

Production Facilities

98. The Soviets maintain four main tank assembly plants, in Khar'kov, Nizhniy Tagil, Omsk, and Chelyabinsk (see figure 16). The Soviets also maintain at least 20 capital repair facilities throughout the USSR and Eastern Europe. All four assembly plants fabricate major tank components as well as assemble tanks, but they all are dependent on producers around the country for a variety of components and subassemblies. Technicians at the capital repair facilities refurbish tanks after the vehicles have been subjected to heavy use. Often the rebuilding includes improvements to the vehicles that result in a product that is more combat capable than the original design.

Expansion and Modernization of Facilities

99. The Soviets' traditional excess of tank production capacity appears to be growing even larger. Since 1965, the area devoted to military production at the three major tank plants—Khar'kov, Omsk, and Nizhniy Tagil—has increased significantly. In addition to

this recent expansion of production area, the tank assembly plants probably are being retooled with a variety of modern assembly equipment. Indeed, the production area expansion may have been undertaken in part to accommodate these new tools, many of which have been imported from the West. The Soviets also are developing new fabrication techniques to take advantage of the capabilities of this new machinery.

100. These improvements probably do not presage a significant increase in output. They probably have been undertaken in an attempt to at least maintain previous production levels in spite of the difficulties involved in the manufacture of vehicles incorporating sophisticated features like laminate armor and requiring the precise assembly of complex components.

101. These improvements should offset the strain that this growing sophistication places on both human and material production resources. New industrial robots probably have been purchased to reduce the number of workers needed in the production process, and the latest generation of machine tools can help workers with relatively modest skills to accomplish a variety of difficult and exacting manufacturing tasks. Moreover, some of these new tools will allow tank assembly workers to batch-produce different types of components and vehicles in relatively rapid succession without the need to halt production and retool whenever a different vehicle must be produced. Future Soviet tank models promise to be even more complex than the current models, and the Soviets undoubtedly are modernizing their tank assembly plants with an eye to the future. The new tools probably will greatly reduce the startup time needed to prepare for the production of a new tank design.

Current Programs

102. Currently, tanks of the T-64, T-72, and T-80 series probably are being serially produced in the USSR. In addition, the Soviets are beginning to modernize extensively their older tanks that will be in service in the 1990s.

Chelyabinsk Tractor Plant

103. The plant at Chelyabinsk [redacted] recently began assembling T-72s—probably the T-72M, but possibly the basic model with a coincidence rangefinder as well. These tanks probably are intended for the export market. Because Chelyabinsk has just begun assembling tanks, we have not yet been able to determine the level of production that the Soviets have programed for this facility. We estimate that it will be relatively modest, probably amounting to no more than a few hundred vehicles a year. Chelyabinsk could be taking over production of these models from Nizhniy Tagil.

Khar'kov Tank Plant

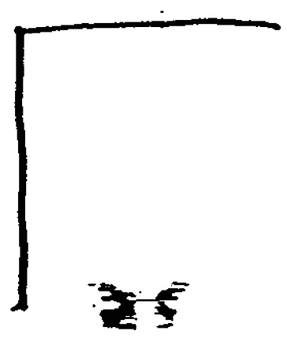
104. The T-64B is being assembled at the tank plant in Khar'kov [redacted] presumably in the new assembly building [redacted] T-64A production may have ceased after T-64B production hit full stride, but this has not been confirmed. T-64As are still being delivered to army units, but it is unclear if these vehicles are new or transfers from units that are receiving newer equipment. In recent years, Khar'kov's annual serial production probably has amounted to somewhere between 500 and 800 vehicles a year.

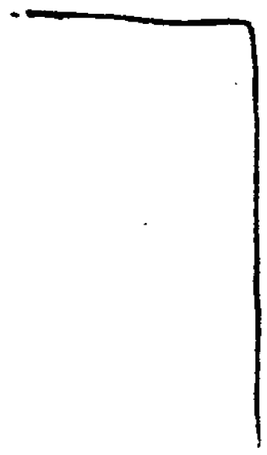
Nizhniy Tagil Tank and Railroad Car Manufacturing Plant

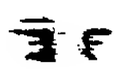
105. The tank plant at Nizhniy Tagil [redacted] produces tanks of the T-72 series, including the M-1981/3 variant. The responsibility for the production of at least one of these variants may have been shifted to Chelyabinsk. This shift may mean that Nizhniy Tagil will concentrate on the serial production of a new tank. If the history of the T-54/55 series can serve as a guide, the T-72 family, which entered series production in 1974, will remain in production for several more years. This suggests that the new tank may be an advanced variant of the T-72 series. In recent years, Nizhniy Tagil's annual serial production probably has amounted to somewhere between 1,700 and 2,300 vehicles a year. In addition to its assembly activities, Nizhniy Tagil is manufacturing components for use in the modernization of T-54s, T-55s, and T-62s.

Omsk Tank Plant

106 The T-80 probably is in serial production at Omsk [redacted] It is difficult for several reasons to predict future annual tank production levels at Omsk. Despite its capacity, Omsk has never produced as many tanks as Nizhniy Tagil. The last serial production program at Omsk was the T-55, and the annual T-55 production at Omsk never exceeded 1,200 a year. Moreover, we cannot discount the possibility that Omsk will serially produce other weapons in addition to tanks.







Future Programs

107. Given the level of uncertainty regarding current Soviet tank production programs, we cannot estimate the precise composition, scope, and timing of future production with a high degree of confidence. We believe, however, that a new tank design or designs probably will soon enter serial production, but these are apt to be refined versions of the second postwar generation of tanks. We expect that an entirely new design will certainly be available for fielding by the 1990s. We also believe that the Soviets will not produce nearly as many tanks annually as they did during the late 1960s and early 1970s, when annual production often exceeded 4,000. We judge it more likely that they will continue to produce an average of about 3,000 tanks per year, as they did in the 1973-83 period. We estimate that this level of production would allow them to continue to keep their tank force opposite NATO equipped with modern tanks as well as to supply their traditional export customers with a flow of new vehicles that matches delivery rates of the past several years.

108. We believe that the Soviets will not attempt to achieve a higher rate of production for several reasons. The latest tank models are much more expensive to produce. Given the growing civilian competition for ever scarcer economic resources and the army's ambitious modernization agenda—which includes many objectives besides the procurement of new tanks—we do not believe the Soviets can afford to procure as many tanks as they did during the late 1960s and early 1970s. We see the Soviets' ambitious modernization program for T-54s, T-55s, and T-62s as a cost-cutting response to these sharply increasing production and procurement costs. If the Soviets planned to procure 4,000 to 5,000 new tanks a year, we doubt they would undertake so extensive a modernization program throughout the ground forces. Therefore, the recent expansion and modernization of tank production facilities probably was undertaken to enable the Soviets to maintain the average annual production level of the last 10 years.

D. TANK DEPLOYMENT

109. Soviet strategy for tank deployment ensures the most operationally efficient use of various tank models and minimizes the need to procure new tanks.[5] Generally, the Soviets assign the newest, most capable tanks to units that have the highest probability of becoming involved in combat with NATO forces in Central Europe. Ready divisions in the Baltic, Belorussian, and Carpathian Military Districts, selected training units, and ceremonial units are usually the first to receive a new tank model as permanent issue. However, after the General Staff is convinced that the new model can be reliably maintained by the army's equipment support structure, the new model is sent to selected Soviet units in Eastern Europe. In recent years, modest numbers of new tanks have also been sent to selected units opposite China. Only later do units in other western military districts receive the new model. Older tanks replaced by the new models are usually reassigned to units less likely to engage NATO forces in Central Europe. The oldest tanks in the inventory are held in mobilization base divisions or low-strength cadre divisions, especially those in interior military districts. These are the units least likely to become involved in combat with NATO ready divisions.

110. As a general rule, during a typical tank's 25 to 30 years in active service it spends the first 10 to 15 years in the inventory of ready divisions in the western USSR or in the forward area and the last 10 to 15 years in other parts of the country in not-ready divisions. Tanks that emerge from their active service in relatively good condition may be placed in equipment reserves or refurbished for export. Other old tanks probably are cannibalized for parts, then scrapped.

111. Equipment replacement is a continuous but slow process; even in the Western Theater of Military Operations (called a TVD after the Russian *teatr voyennykh deystviy* for "theater of military operations") roughly half of the active tank inventory, at any given time, is composed of vehicles of the previous design generation. In 1983, for instance, the medium tank inventory of the Western TVD comprised 11,150 T-64s, T-72s, and T-80s, and 7,950 T-54s, T-55s, and T-62s.

The Soviet Tank Force: Present and Future

112. Analysis of the composition of the current and future Soviet tank force reveals dramatic differences in capabilities among the various constituent theaters of military operations. (See table 1 for a breakdown of the current and future Soviet tank force by tank type.) The tank inventory of the Western TVD, which would

[5] This analysis grew out of the Warsaw Pact ground forces estimate that is contained in the Land Armaments and Manpower Model (LAMM), a data base recently developed by CIA, DIA, NPIC, and the US Army to facilitate the study of Warsaw Pact ground forces.

Table 1
Current and Future Tank Inventories of Soviet Ground Forces[a]

	1983	1985	1990
PT-76 light tank	1,181	524	523
JSU-122 assault gun [b]	26		
JSU-152 assault gun [b]	188	188	94
SU-100 assault gun [b]	60		
JS-3 heavy tank	243	228	
T-10 heavy tank	397	293	293
T-34 medium tank	21		
Flamethrower tank	31		
T-54/T-55 medium tank	19,440	16,655	5,955
T-62 medium tank	14,227	13,317	6,025
T-64/T-64A medium tank	7,163	7,376	7,201
T-64B medium tank	1,466	2,480	4,565
T-72/T-72M medium tank	5,633	5,565	5,167
M-1981/3 medium tank (SMT)	1,658	3,220	5,703
T-80	489	1,616	5,244
Modernized T-55		853	5,909
Modernized T-62		957	8,239
Future Soviet tank design(s)			563
Total	52,223	53,272	55,481

[a] Includes inventories of active units as well as equipment of mobilization base divisions.
[b] These weapons are included in the equipment count because they are used in place of tanks by selected tank units.

be used against NATO forces in Central Europe in a war between the Warsaw Pact and NATO, is substantially more modern than those of other theaters of operation. The next most capable tank inventories belong to the strategic reserve and the Southwestern TVD. The bulk of the modern tanks in the strategic reserve belong to the Kiev Military District and probably would be used to support the forces operating in the Southwestern TVD. The tank inventories of the Northwestern TVD, the Turkestan Military District, and the Soviet Far East are significantly less capable than those of the Western and Southwestern TVDs and the strategic reserve. These differences in capabilities among the various theaters will persist throughout this decade.

Western TVD

113. The Western TVD comprises forces in the Baltic, Belorussian, and Carpathian Military Districts and the Groups of Soviet Forces in East Germany, Poland, and Czechoslovakia (see figure 21). Currently, the tank inventory of this TVD—including mobilization base divisions—is composed of about 19,000 medium tanks and a few hundred light tanks and assault guns that serve in a medium tank role (see figure 22, pages 39 and 40). A little more than half of this force is made up of tanks whose designs were finalized after 1961—the T-64, the T-72, and the T-80. The remainder comprises models designed before that date—the T-54, the T-55, and the T-62. The size of this inventory probably will not grow appreciably in this decade, but its composition is expected to change substantially. By the end of 1985, T-64s, T-72s, and T-80s probably will make up 75 percent of the Western TVD tank force and, by the end of 1990, nearly 100 percent.

Northwestern TVD

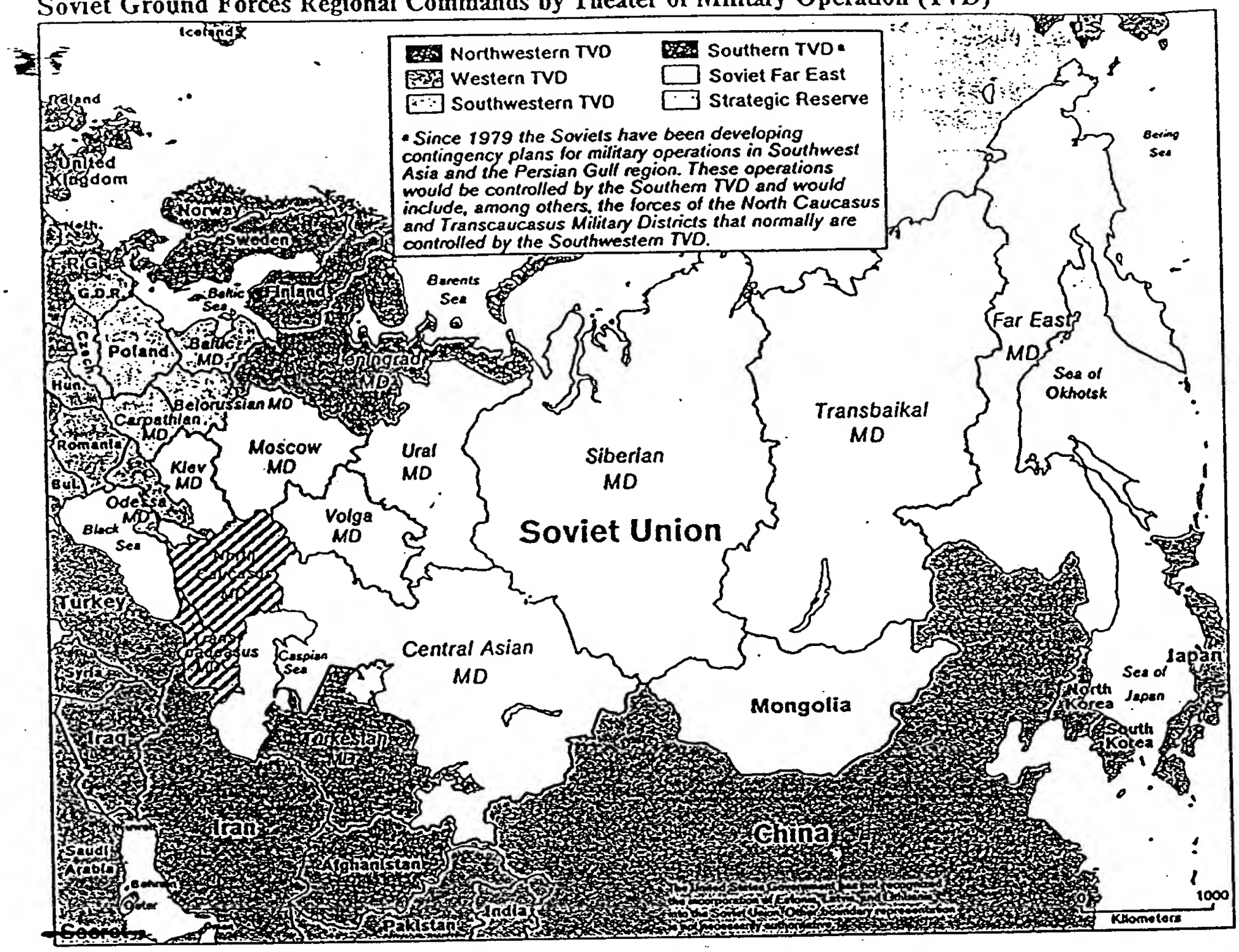
114. The Northwestern TVD is made up of the forces of the Leningrad Military District. Currently, the tank inventory of this TVD is composed of about 1,150 medium tanks and about 450 light tanks, but only about 15 percent of the medium tanks were designed after 1961. By the end of 1990, this force probably will not have changed much in size, but new tank models will account for about a third of the inventory.

Southwestern TVD

115. The Southwestern TVD includes Soviet forces in Hungary and the Odessa, North Caucasus, and Transcaucasus Military Districts. Currently, this theater's tank force is made up of about 6,550 medium tanks and a few battalions of light tanks. Only a little more than 20 percent of the medium tanks were designed after 1961. By the end of 1990, the inventory will have grown by about 200 tanks, and more than half of this inventory probably will be made up of modern tanks.

116. The Turkestan Military District includes Soviet army units currently serving in Afghanistan as well as units actually stationed within the district. Currently, the district's tank force is composed of nearly 2,000 medium tanks of older design and a few light tanks. By the end of 1990, the inventory probably will have grown by about 300 vehicles, and the bulk of the medium tanks probably will have been modernized.

Figure 21
Soviet Ground Forces Regional Commands by Theater of Military Operation (TVD)



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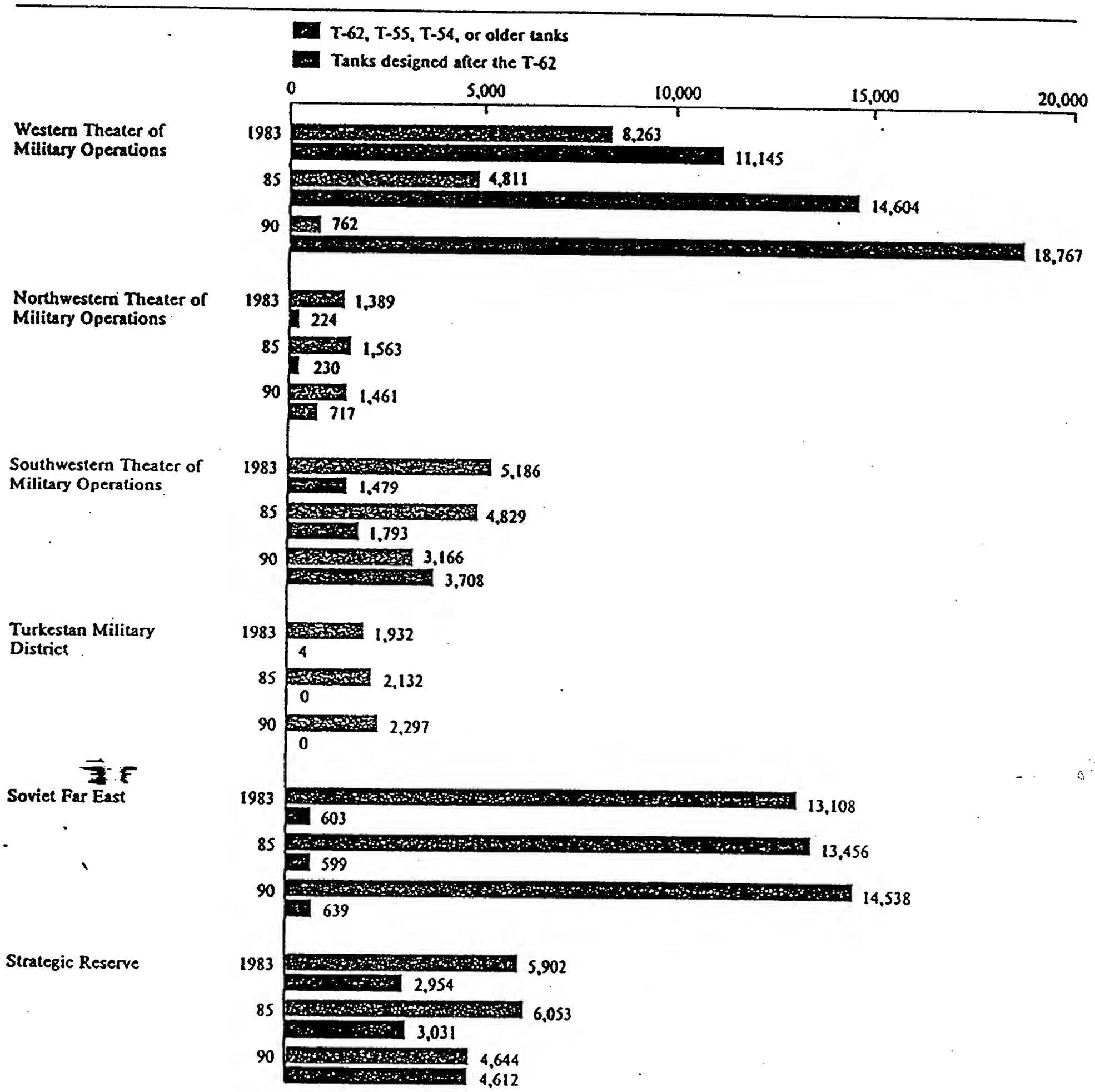
Soviet Forces in the Far East

117. Forces in the Soviet Far East are those of the Central Asian, Siberian, Transbaikal, and Far East Military Districts. Currently, the tank inventory of these forces consists of about 13,700 vehicles, nearly all of which are older models. By the end of 1990, this tank force probably will have grown by nearly 1,500 vehicles, and the quality of the force will have improved. Although probably only about 5 percent will be tanks of relatively new design, about 7,300 of the older models probably will have been modernized.

The Strategic Reserve

118. The ground forces of the Kiev, Volga, Moscow, and Ural Military Districts are generally considered to make up the strategic reserve of the Soviet army, although the forces of the Kiev MD are much more capable than the others and would probably be committed to combat at a much earlier point during a general war. Currently, the tank force of the strategic reserve consists of about 7,800 medium tanks and 1,100 light and heavy tanks and assault guns serving in a tank role. One-third of the medium tank inventory is made up of tanks whose designs were finalized after 1961. By the end of 1985, the strategic reserve tank force probably will have increased by a few hundred vehicles, but the percentage of medium tanks of relatively modern design will remain the same. By the end of 1990, the strategic reserve tank force probably will have grown to about 9,250 vehicles, and about 50 percent of this force will be made up of modern tanks. The rest probably will be made up largely of modernized T-54s, T-55s, and T-62s.

Figure 22
Changing Composition of Tank Forces in Warsaw Pact



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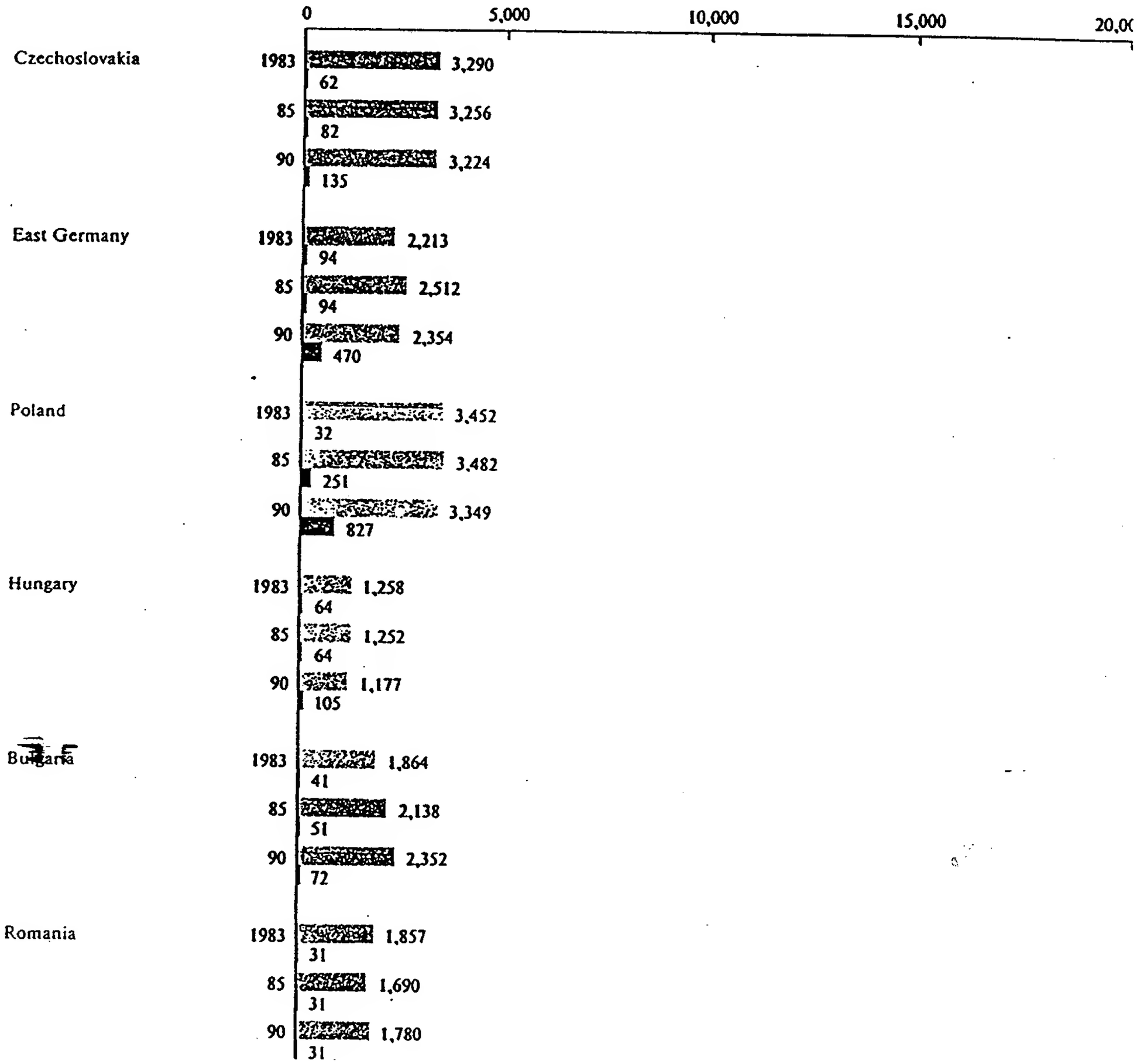
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32
85
3,482
251
90
3,349
827
Hungary
1983
1,258
64
85
1,252
64
90
1,177
105
Bulgaria
1983
1,864
41
85
2,138
51
90
2,352
72
Romania
1983
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31
85
1,690
31
90
1,780
31

The Non-Soviet Warsaw Pact Tank Force: Present and Future

119. Soviet forces in the Western and Southwestern TVDs would be joined by non-Soviet Warsaw Pact allied forces in the event of a general war with NATO. For the last several years, the Soviets have been encouraging their NSWP allies to improve, among other things, their tank force capabilities. The NSWP states have responded with varying degrees of enthusiasm and success.

Czechoslovakia

120. The Czechoslovak tank inventory currently contains about 3,350 medium tanks, all of which are T-54s and T-55s except for two to four battalions of T-72s and two battalions of T-34s. We project that by the end of 1985, the T-34s probably will have been retired, and the tank inventory will still contain about 3,325 vehicles, most of which will still be T-54s and T-55s. By the end of 1990, the size of the Czechoslovak tank force probably will be virtually the same. About 50 percent of it probably will be made up of T-72s, and the rest will be modernized T-54s and T-55s.

East Germany

121. The East German tank inventory currently is composed of about 2,300 medium tanks and a few light tanks. Except for three battalions of T-72s, the medium tanks are T-55s. By the end of 1985, the inventory probably will contain about 2,600 medium tanks, but there probably will be no T-72s added to the inventory. By the end of 1990, the total tank inventory may have grown to about 2,825 medium tanks, about 15 percent of which will probably be T-72s and about 20 percent, modernized T-62s.

Poland

122. The Polish tank inventory currently is made up of about 3,400 medium tanks and 100 light tanks. The bulk of the medium tanks—about 75 percent—are T-54s and T-55s, while a little over 20 percent are T-34s. The Poles also possess a battalion of T-72s. By the end of 1985, the Poles' medium tank inventory may grow to 3,800. T-72s almost certainly will make up less than 10 percent of this force. By the end of 1990, the light tanks probably will still be in service, while the medium tank inventory probably will have increased to about 4,100 vehicles. T-72s probably will make up nearly 20 percent of these medium tanks, while modernized T-55s probably will make up a little more than 10 percent. The remainder will be T-55s, T-54s, and T-34s.

Hungary

123. The Hungarian tank inventory currently is made up of nearly 100 light tanks and about 1,200 medium tanks. Ninety-five percent of the medium tanks are T-54s and T-55s; the remaining 5 percent are T-72s. We project that by the end of 1985 neither the size of the medium tank force nor its composition will have changed. By the end of 1990, the light tank probably will have been retired, and the size of the medium tank inventory will shrink slightly. By that date, nearly 10 percent of those vehicles probably will be T-72s.

Bulgaria

124. The Bulgarian tank inventory currently contains about 1,900 medium tanks. Two-thirds of them are T-54s and T-55s, while nearly one-third are T-34s. The Bulgarians also have one battalion of T-72s. By the end of 1985 this tank force probably will have grown to about 2,200 vehicles, and have changed only slightly in composition. Nearly all of the force probably will continue to be made up of tanks designed before 1961. We project that by the end of 1990 the size of the tank inventory will have increased by another 200 vehicles. Modernized T-62s probably will make up about 15 percent of this force, while T-72s will make up less than than 5 percent. T-34s probably will make up a little more than 20 percent of the inventory.

Romania

125. The Romanian tank inventory currently contains about 1,900 medium tanks—including one battalion of T-72s—and 300 assault guns serving in a tank role. Nearly one-half of the medium tanks are T-54s, T-55s, and T-55 derivatives. The remainder are T-34s and assault guns. By the end of 1985, the Romanian tank force probably will have shrunk slightly, and the continuing introduction of locally produced T-55 derivatives may reduce the proportion of T-34s in the force to about one-fifth. By the end of 1990, the assault guns probably will have been retired, and the force will total about 1,800 medium tanks. About 80 percent of these vehicles probably will be modernized T-54s and T-55s and improved versions of the T-55. Nearly 20 percent of the force probably will still be T-34s. The Romanians probably will still have only one battalion of T-72s.

Export of Soviet and Non-Soviet Warsaw Pact Tanks

126. The Soviets, Poles, and Czechoslovaks have aggressively marketed both newly produced and refurbished Soviet-designed tanks around the world. Currently, T-34s that have been refurbished and, in some cases, improved can be found in various Third World armies, and T-54s and T-55s are in service on every continent except Antarctica and Australia. T-62s still serve as frontline tanks in the armies of Afghanistan, Cuba, Egypt, Iraq, Israel, North Korea, Libya, Syria, Vietnam, and South Yemen. The T-72 has also been marketed outside of the Warsaw Pact (see table 2). Currently, the armies of Algeria, India, Iraq, Libya, Syria, and Yugoslavia have purchased basic or improved T-72s. In some cases, the numbers of T-72s involved have been nominal, but, in the case of India, Iraq, Syria, and Libya, the purchases have been more substantial. To date, T-64s have not been exported, even to Warsaw Pact allies.

Table 2
Soviet Exports of Tanks in T-72 Series to States Outside Warsaw Pact[a]

Algeria	90-115
India	300-350
Iraq	600-825
Libya	130-180
Syria	750-975
Yugoslavia	60
Total	1,930-2,505

[a] Figures reflect deliveries made by 30 September 1984.

127. Currently, the Soviets are marketing at least one improved version of the T-72 in the Third World, and in the near future they probably will begin to market a version of the T-80 outside the Warsaw Pact. Potential customers include those countries that have purchased T-72s in the past. The USSR probably will also market modernized T-54s, T-55s, and T-62s to customers that do not need the latest model tanks or cannot afford them.

128. For many years the Poles and Czechoslovaks have marketed their domestically produced T-55s outside the Pact. T-55 production appears to have ceased in Czechoslovakia and should cease in Poland by the end of 1985. After that, both countries may seek to sell modernized T-54s and T-55s and eventually may try to market T-72s produced under license, presumably in areas where they successfully marketed T-55s in the past.

129. The Romanians recently entered the export market with the TR-77 and have reportedly sold 200 to the Egyptian Army. The Romanians probably will switch to production and marketing of the more capable TR-80.

E. IMPLICATIONS FOR NATO

130. Our lack of reliable, detailed information about the composition, configuration, and dimensions of the frontal armor of all modern Soviet tanks except the basic T-72 makes it difficult to draw reliable conclusions about how NATO antitank forces would fare when confronting a Soviet conventional offensive spearheaded by Soviet tank units. We must assume that our estimates about the protection levels of Soviet tank armor are correct and that we have also correctly estimated the capabilities of the Soviet 125-mm smoothbore gun and its ammunition.[6]

138. Despite US antitank forces' improving position in regard to individual engagements with Soviet vehicles, they and their NATO allies still are confronted with the substantial numerical superiority of Soviet tank forces.[9] This fact will make it necessary for US soldiers responsible for engaging Soviet tanks with direct-fire, ground weapons to make intelligent use of well-prepared defensive positions, to exercise fire discipline, and to strive whenever possible to engage the enemy from above or from the flanks. Such tactics will remove the guesswork from frontal engagements by ensuring kills even when ranges are long or when US soldiers are armed with older, less capable munitions. Even if these soldiers are able to apply these tactics successfully, adequate levels of well-coordinated air and artillery support may prove to be critically important to a successful defense.

139. This situation probably will not change significantly for several years because slow improvements in

[9] The Warsaw Pact's tank inventory in the Western Theater of Military Operations outnumbers NATO's tank inventory in central Europe by a nearly 3-to-1 margin.

Soviet posture will be offset by gradual improvements in US antitank capabilities. Many of the T-62s in the Groups of Forces are being replaced with T-80s, T-64As and T-64Bs, but this replacement process is proceeding slowly. [redacted] A variety of more capable air and artillery fire support weapons should also be available [redacted]

140. Thus, for the foreseeable future Warsaw Pact tank forces will face a formidable array of NATO antitank weapons. However, the Pact can still feed many more highly capable tanks into a conflict in central Europe than NATO. Ultimately, this fact alone presents NATO commanders with a problem that cannot be solved strictly through technological advances.

ANNEX A

Trends in Soviet Tank Gun Ammunition

1. When the Soviets adopted the smoothbore gun as the principal armament of their main battle tanks, they did so to achieve high muzzle velocities and, therefore, flatter ballistic trajectories and greater kinetic-energy penetrations. Because no rifling was present in the barrel to impart spin to stabilize the projectile in flight, Soviet ammunition designers developed projectiles that incorporated fins to provide stabilization. Following traditional Soviet practice, which reflects the varied nature of the combat missions that a Soviet main battle tank would be expected to undertake, the Soviets developed three main types of ammunition: a kinetic-energy armor-piercing round, a shaped-charge round, and a high-explosive fragmentation round. The first two types were designed principally to destroy armored vehicles, while the third type was intended for use against "soft" targets such as personnel or lightly constructed fortifications.

2. The T-62's armor-piercing round uses a long-rod penetrator; that is, it attacks enemy armor by means of a metal dart that is long and thin (see figure 23). This dart is encased in a jacket or sabot that holds it in place in the gun barrel. The sabot falls away after the dart leaves the barrel: The dart moves at high velocity and forces its way through armor plate by concentrating its kinetic energy in the small cross section tip of the dart. The standard armor-piercing projectile for the T-62, called the BM-6, uses a steel dart, and it performed impressively in its day. Recently, we have discovered that the Soviets fielded an armor-piercing round for the T-62 that incorporated a steel dart with a tungsten alloy cap. Apparently, they discontinued producing this round, the BM-3, in favor of the BM-6.

3. The T-62's shaped-charge round, which uses the BK-4M warhead, attacks armor plate by means of a jet of molten metal. Its warhead consists of a cylindrical block of explosive with a copper-lined, cone-shaped

Figure 23
Cutaway View of a Soviet BM-9 125-mm Kinetic-Energy Tank Gun Round

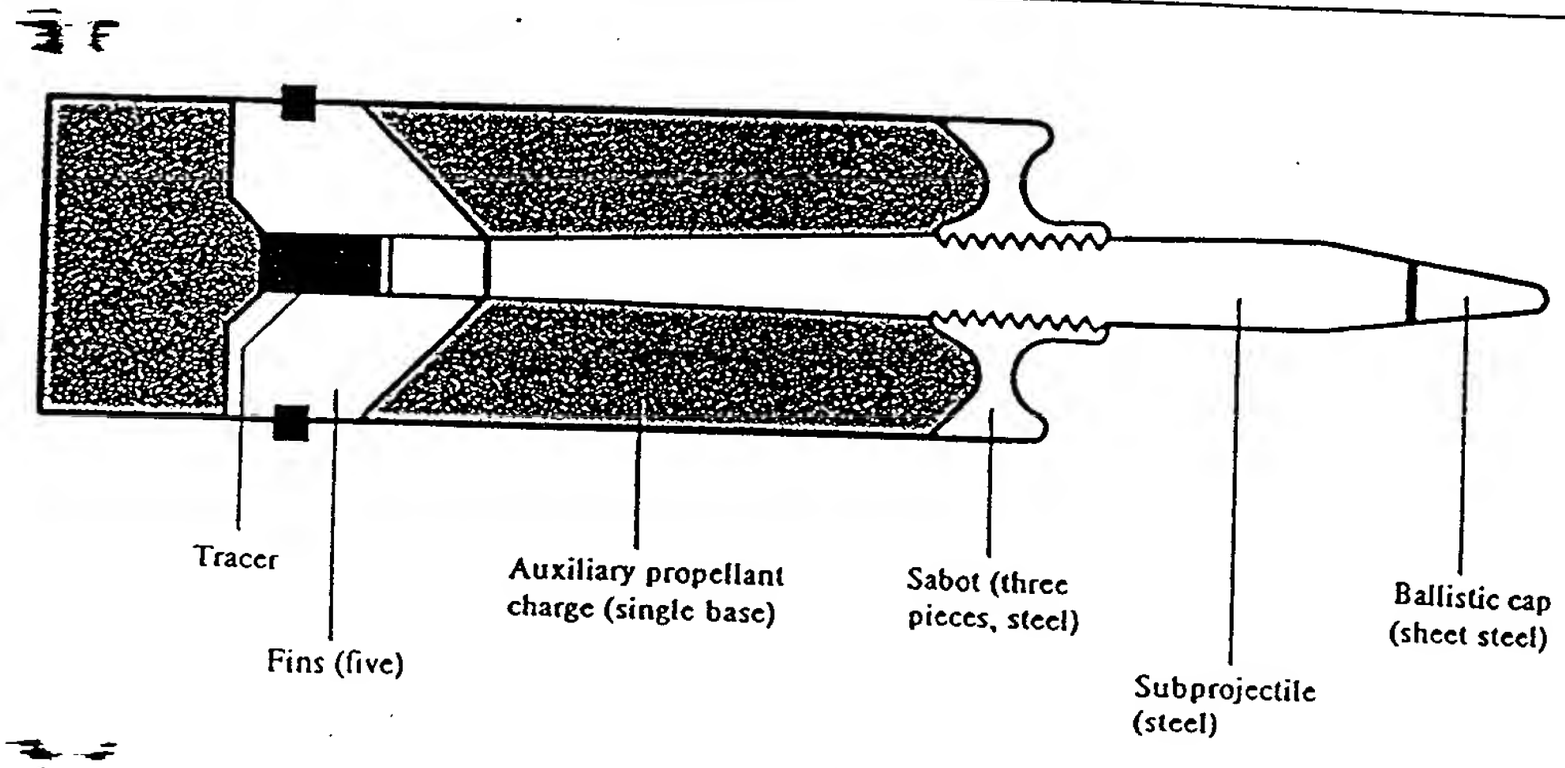

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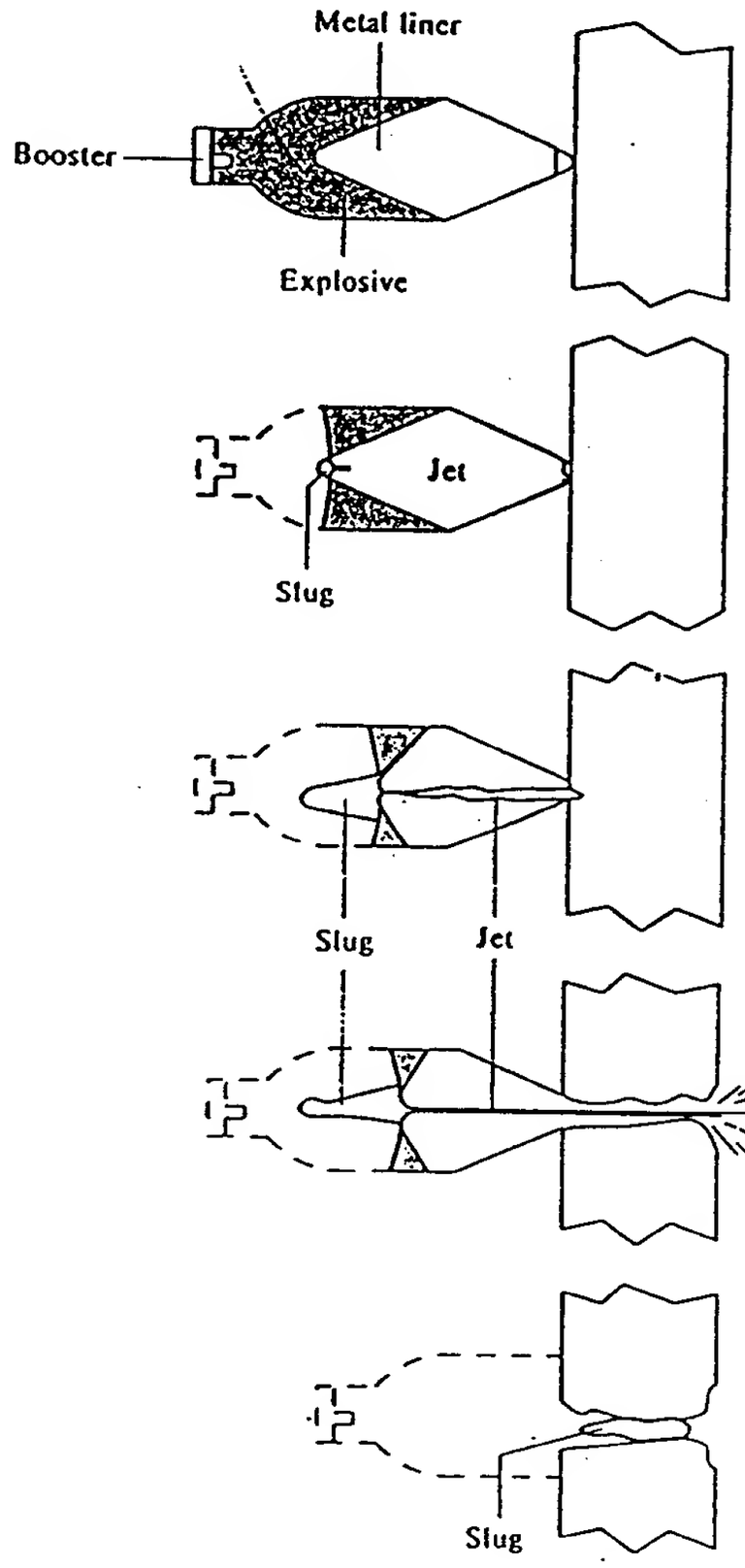
Figure 24
Diagram Illustrating Penetration of Rolled Homogeneous Armor by a Shaped-Charge Warhead



A. Physical contact with target.
Detonation begins.

B. Detonation continues.
Jet and slug start to form.

C. Detonation continues.
Formation of jet and slug continues.
Jet makes initial contact with target.

D. Detonation continues.
Formation of jet and slug continues.
Target is penetrated.

E. Detonation completed.
Slug material remains in newly formed cavity.

depression in the forward end (see figure 24). When the explosive is detonated at or near the surface of its target, the metal of the cone collapses and is propelled forward in the form of a thin high-speed jet. Essentially, this jet flows through the armor in the same way a stream of water from a garden hose would flow through a mass of compacted mud. Generally, the penetration of a shaped-charge warhead is directly proportional to the diameter of the metal cone: the larger the diameter, the greater the penetration potential. Penetration capability is also sensitive to the explosive fill, the material and design of the cone, the general precision of manufacturing, and the standoff distance from the target.

4. The second postwar generation of Soviet tanks all incorporate a 125-mm smoothbore gun, which we believe to be a direct outgrowth of the T-62's gun.[10] The 125-mm gun's KE projectile, called the BM-9, closely resembles the T-62's original steel dart projectile, although it can penetrate more armor because of greater mass and higher velocity. The shaped-charge round—its warhead is called the BK-14M—is also similar in design to the T-62's, but it has greater penetration capability by virtue of its larger diameter. Likewise, the high-explosive fragmentation round is marginally bigger and, therefore, more lethal than that of the T-62. It also incorporates improved explosives and a better warhead design.

[10] The early production version of the T-64 series mounted a 115-mm gun, but we believe that these tanks were later retrofitted with 125-mm guns.

5. These rounds all come in two pieces—a propellant charge and the projectile. Their design enables this large ammunition to be easily handled by both crews and automatic loaders. Except for its metallic stub, the propellant casing is combustible. It is consumed during firing, thus eliminating the problem of disposal of spent shell casings that could quickly clutter the fighting compartment in combat. The metallic stub is automatically ejected from the rear of the turret in the T-72 series and automatically returned to the loader carousel in the T-64 series.

6. The BM-9 KE projectile was followed by a projectile called the BM-12 which apparently provides no appreciable improvement in penetration. The BM-12 incorporates a tungsten carbide core, and evidence strongly suggests that the 125-mm KE projectile called the BM-23 incorporates a penetrator with a tungsten alloy core. This denser metal probably gives the BM-23 at least 20 percent more penetration potential than the BM-9 or BM-12's steel dart. We believe that the Soviets will develop a new series of rounds, which we assume all have greater capability than current rounds.

7. No evidence exists to suggest that an improved shaped-charge round has been developed for the 125-mm gun. The AT-8 ATGM probably supplements or, in certain instances, replaces the shaped-charge round for the T-64B and the T-80, and it almost certainly can penetrate more armor than the BK-14M warhead.